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Volume 2
Number 7
September 1984
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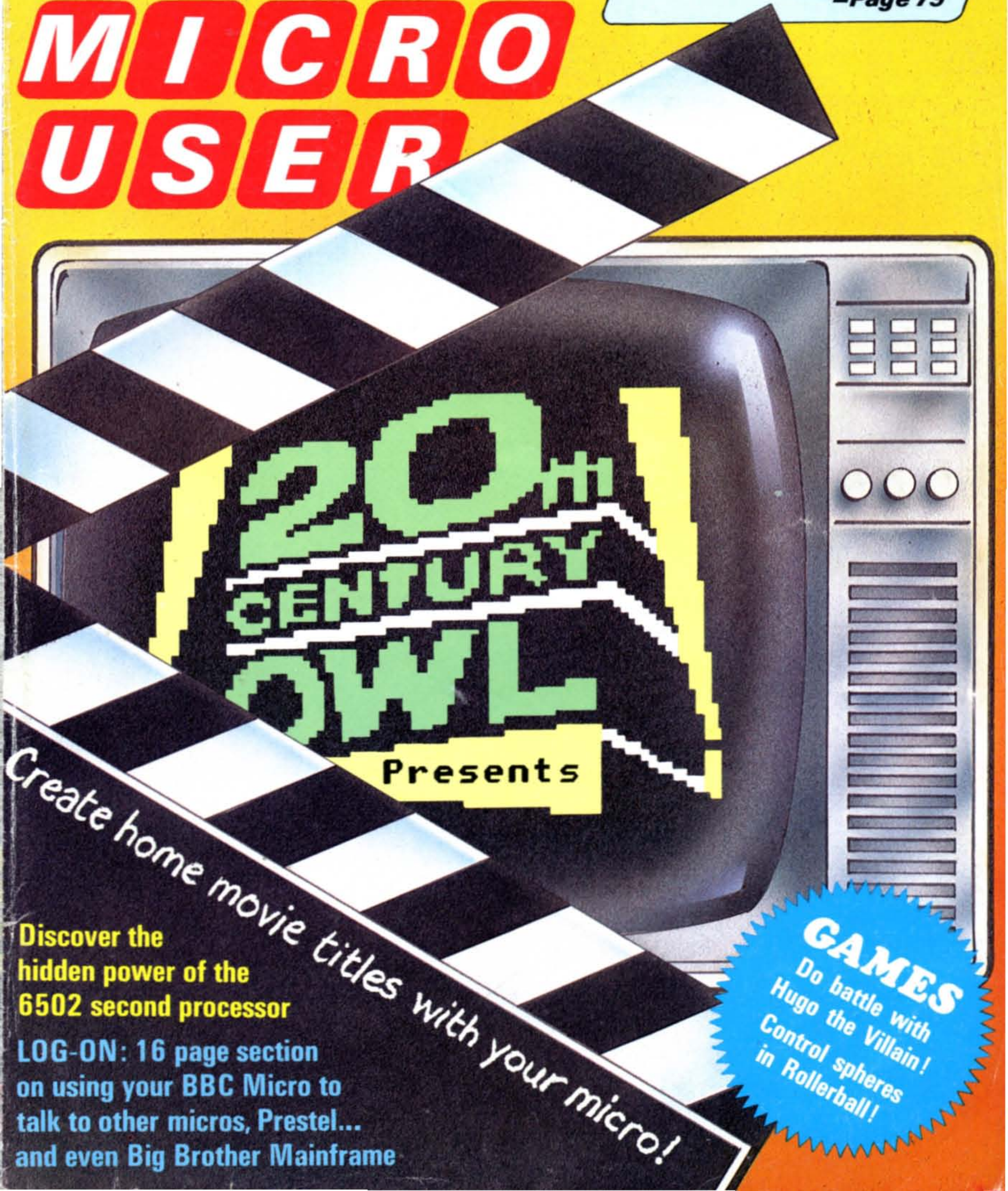

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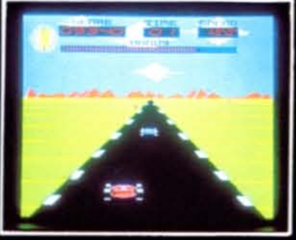
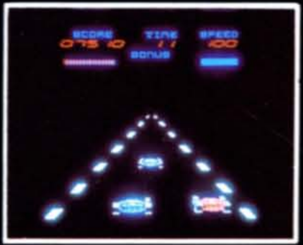
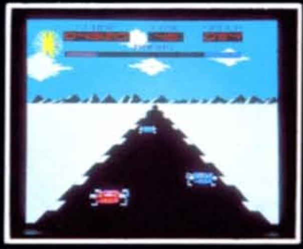
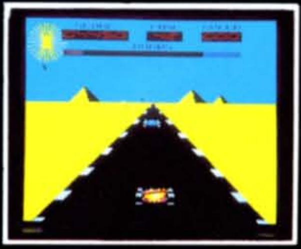
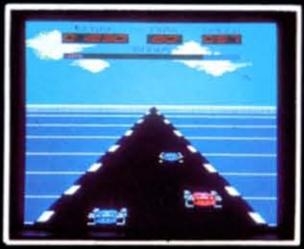
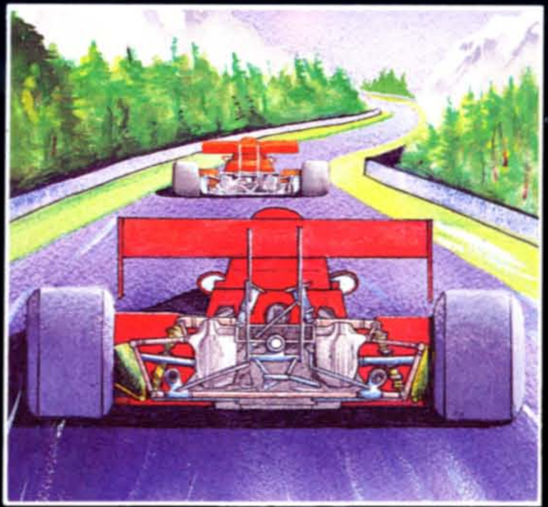

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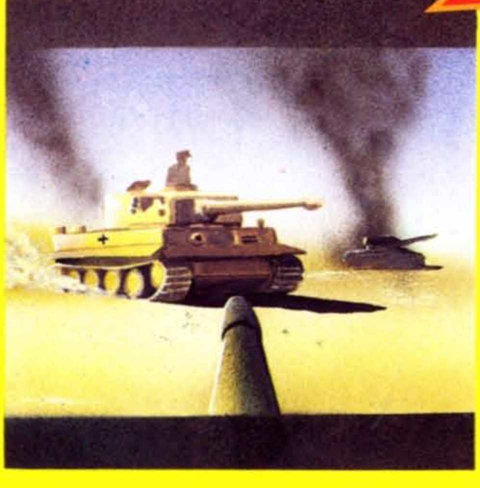
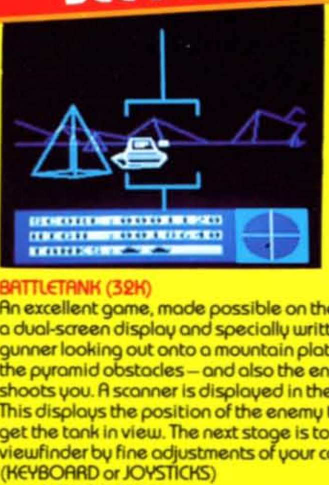
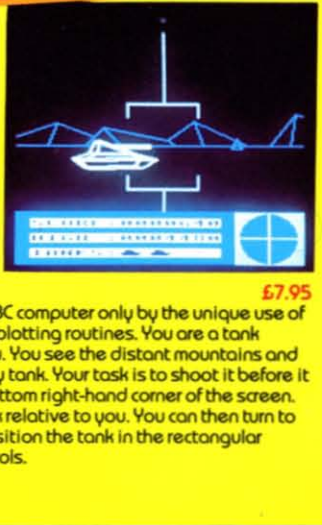

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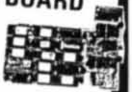

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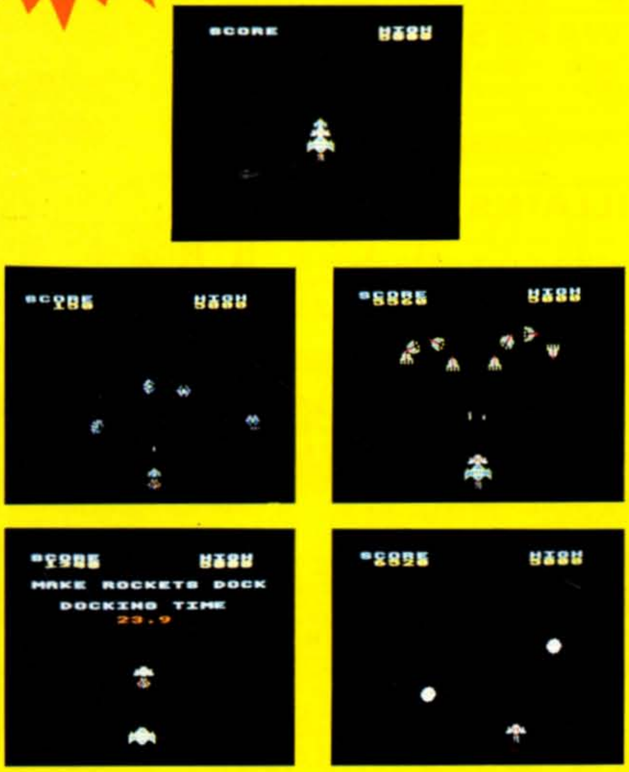

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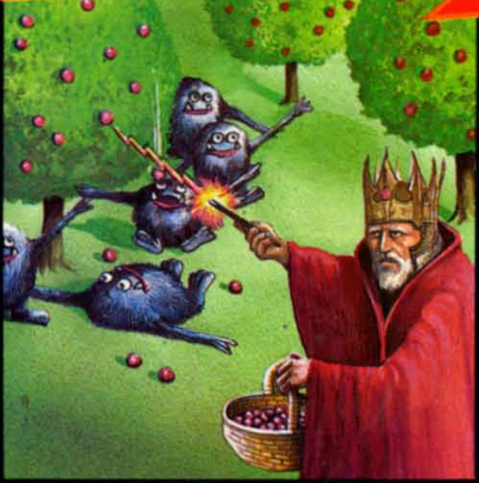

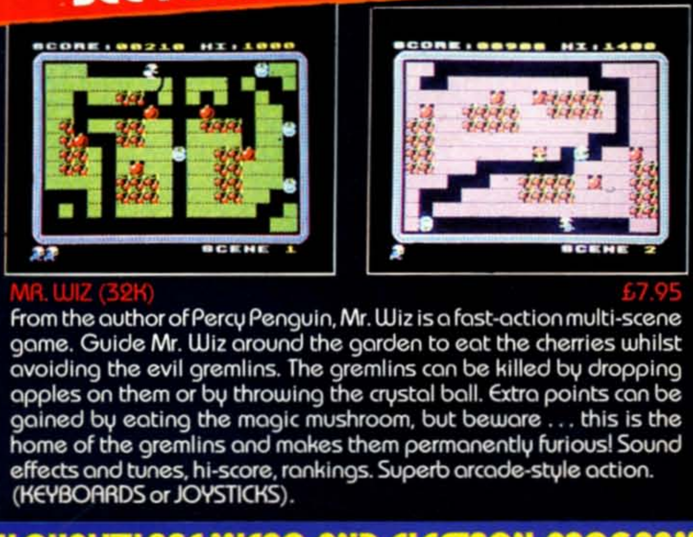

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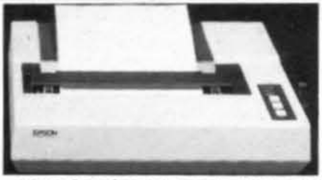

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VIEW PRINTER DRIVER FOR EPSON FX80

This printer driver will enable the user to fully exploit the potential of the highly versatile Epson FX80 printer making text presentation both impressive and attractive.

A choice of 12 HT code options covering the full range of FX80's fonts is made available to the user. One of the options allows the user to call up the user defined characters stored in the printer buffer. However, the most powerful feature of the driver is its ability to offer the use of multiple HT codes in the same piece of text.

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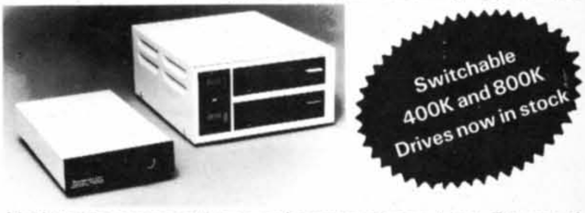

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Continued on page **11** →

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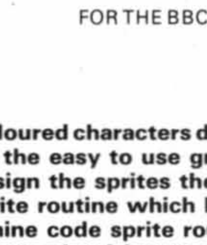

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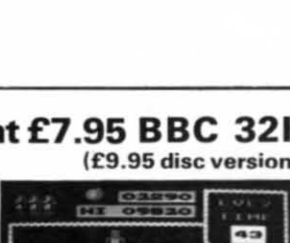

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Preliminary Information

- **The new Eprom Programmer will now program 2516, 2532, 2564, 2716, 2732, 2764, 27128 and 27256 + 5v eproms, and all but the 27256 in a single pass.**
- The programmer will be supplied with integral power supply, and interfaces with the BBC via the 1MHz bus. It is fully buffered and complies with Acorn protocols. There is no power drain from the computer.
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- Can read, blank check, program and verify at any address/addresses on the eprom.
- **Full Tape/Disc filing facility.**
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EPROM ERASERS

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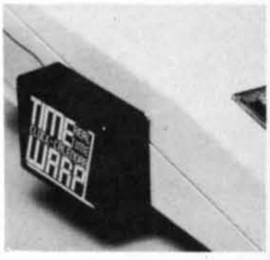
*Maxm. No. of records/file: 5000
*Maxm. record size 6K
*Maxm. No. of fields 62.
*9 level hierarchical search system with facilities to store results of searches.
Searches can be any one of the following: Search, Include, Exclude, Combine, Common or Difference.
£112.00 + £2 carriage

SPECIAL OFFER
EPSON FX80 PRINTER
ONLY £325
including BBC printer lead
Twelve Months full warranty.

'TIME-WARP' REAL-TIME-CLOCK/CALENDAR

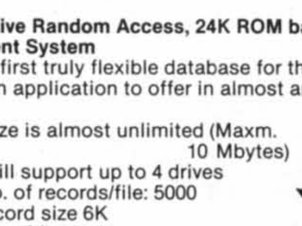
A low cost unit that opens up the total range of Real-Time applications. With its full battery backup, possibilities include an Electronic Diary, continuous display of 'on-screen' time and date information automatic document dating, precise timing & control in scientific applications, recreational use in games etc — its uses are endless and are simply limited by one's imagination. Simply plugs into the user port — no specialist installation required — No ROMS. Supplied with extensive applications software.
Please phone for details.
£29.00 + £2.50 carriage.



SMARTMOUTH

The original 'infinite speech'.
Still the best.

A ready built totally self contained speech synthesiser unit, attractively packaged with built-in speaker, AUX output socket etc. — no installation problems! It allows the creation of any English word, with both ease and simplicity, while, at the same time being very economical in memory usage. You can easily add speech to most existing programs Due to its remarkable infinite vocabulary, its uses spread throughout the whole spectrum of computer applications — these include industrial, commercial, educational, scientific, recreational etc. No specialist installation — no need to open your computer, simply plugs into the the user port — and due to the simple software, no ROMS are needed.



SMARTMOUTH is supplied with demo and development programs on cassette, and full software instructions. **£37 + £2.50 carriage.**

BUZZBOX

This is a full specification, direct connect modem, with both Originate and Answer modes, allowing access to the many databases, bulletin boards, as well as inter-computer communications. The modem conforms to the international CCITT V21 300/300 Baud standard. (NOTE: Not suitable for PRESTEL). Having full BT Approval, it connects directly to the telephone line, for optimum performance. Being battery powered, it is totally portable (optional power supply available). **£69.** BBC Lead **£3.50.** External PSU **£8.00.**

BEEBUGSOFT

A professional range of Firmware/Software to suit both the advanced programmer and the user. From the well known 'EXMON' and 'TOOLKIT' to the WORDWISE SPELLCHECK.

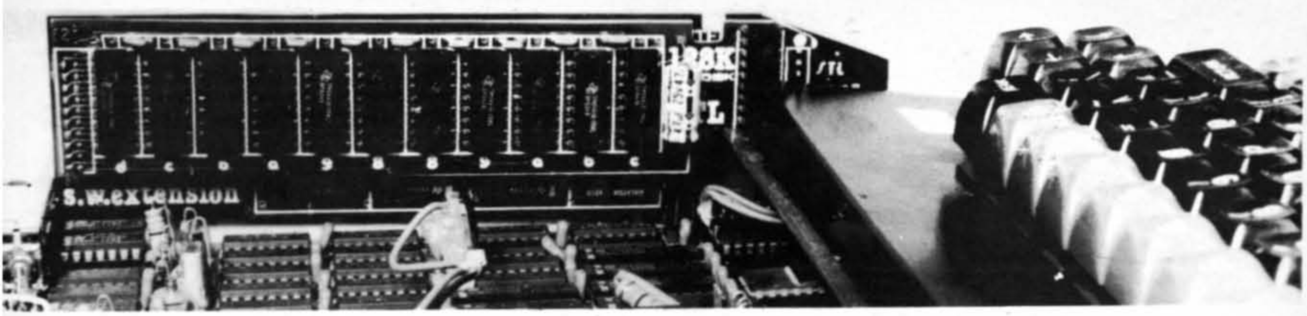
MORE FROM TECHNOMATIC ON PAGES... 8 & 9

MAIL ORDERS TO: 17 Burnley Road, London NW10 1ED
(Tel: 01-208 1177 (4 lines) Telex 922800)
SHOPS AT: NW London: 15 Burnley Road, London NW10 1ED
(Dollis Hill 2 mins walk, ample car parking space)
West London: 305 Edgware Road, London W2. Tel: 01-723 0233
(Near Edgware Road)

TECHNOMATIC LTD.

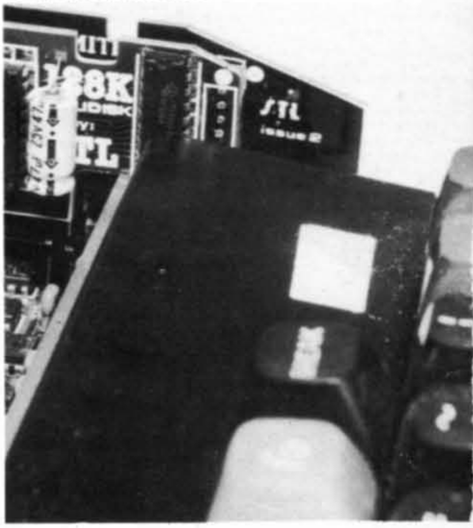
All prices exclude carriage & VAT. Please add carriage as indicated and add 15% VAT to the total order value. For fast delivery telephone your order quoting VISA or Access card or official order number (Minimum telephone order £5).

SOLIDISK SIDEWAYS RAM: 8,000 UNITS SOLD



"Exciting" (ACORN USER JAN 84), **"Power to your Beeb"** (PCN 61, MAY 84)

"Break the Ram Barrier" (A&B)



HOW ABOUT COMPATIBILITY?
The Sideways RAM is completely compatible with all issues of BBC computers, disks, all sideways ROMs, second processor, Torch disk pack, Teletext, Econet etc. but NOT with ROM extension boards, since it can replace them.

Its power consumption is so low that you can use it in conjunction with twin disks.

HOW DOES IT WORK?
Occupying the same place as sideways ROMs (such as BASIC, DFS, CPN etc), it is treated like other Sideways ROMs and therefore can replace them.
The Machine Operating System uses Sideways RAMs as naturally as Basic, without procedures or programming rules.
Sideways RAM can run any language, any filing system including Hi-Basic and second processor DFS.

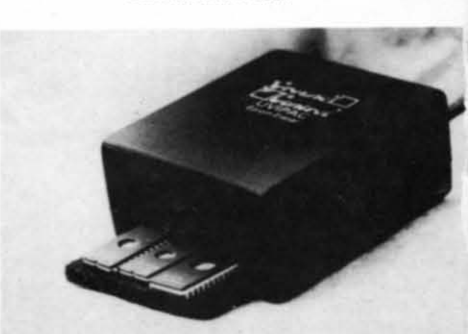
SIDEWAYS RAM POWER IS IN THE SOFTWARE:
Different from Sideways ROMs, Sideways RAM can be written into. This property gives birth to a NEW GENERATION of software for the BBC computer: SERVICE RAMs and VIRTUAL MEMORY PROCESSOR.
Each SERVICE RAM has its own commands and code as its counterpart Sideways ROM but has its own private workspace and storage area thus leaving you with the lowest possible PAGE value (PAGE=&E00). On the other hand, the Virtual Memory Processor can run huge MACRO BASIC programs (Megabytes are not the limit), keep them on disk and uses the basic 32k of RAM as transient program area. All software for the Sideways RAM system is free.

FREE SOFTWARE?
Solidisk Sideways RAMs is bundled with lots and lots of software, FREE and we mean FREE, now and later. It is quite simple: for every Sideways RAM sold, £1 is spent on MORE software. Sideways RAM users are invited to spot new applications and contributions are rewarded at the usual rate of £1 for every 4 bytes of machine code.
The result is printed on the opposite page.

HOW ABOUT THE FUTURE?
Solidisk Sideways RAM is also widely used in schools for ECONET stations, by professional programmers for writing programs, research laboratories for RAM disk data base, at home for wordprocessing and now even games.
New areas are being developed: Telesoft and Teletext logging, Speech Processor assembler and Relational Data base to cite a few.
As the price of 16k EPROMs are as high as £20 at the present time, more Sideways ROM software publishers will be willing to sell their software on disk. Solidisk will mail FREE OF ANY COST their advertisement to ALL Sideways RAM users providing the price of the Disk version reflects savings in the cost of the ROMs. Solidisk believes that the majority of BBC users will have their Sideways RAM fitted before the end of next year.
Also unlike other makes (SIR, APTL, WE Sideways ROM/RAM extension boards and the Aries B20), Solidisk Sideways RAM is expandable from 16k right to 128k and now to 208K.
As a result of VLSI technology and volume of sales, Solidisk products also have a lower shop price than any other products.

OTHER PRODUCTS FROM SOLIDISK:
UVIPAC EPROM ERASER:
Uvipac is powered by the mains, simple to operate and can erase 3 Eproms of any type in just 15 minutes. Uvipac is ideal for home use.

UVIPAC EPROM ERASER



DETACHABLE KEYBOARD CASE:
Remove the keyboard from the BBC computer and instal it in the new case. Replace the old 3" keyboard tail by the new 24" cable and you can work really in comfort even for very long hours. The keyboard case is more a productivity tool than just ergonomics.

CPU CASE:
Replace the top of the BBC computer case by this metal CPU case. Sit your monitor on top (it is tough enough to take even your weight!). The CPU case has 2 compartments for half height 5.25" disk drives with fixing screws, air vents and provision for a bolt-on fan. At first sight, there is no trailing wire. Looking inside, there is enough room to accomodate Teletext Adapter, Second Processor, Solidisk and a fan!

TEAC DISC DRIVES FD55 Series

Datalife
Datalife
Datalife

DOUBLE DENSITY DISK INTERFACE:
2 versions of this double density interface will be available: as direct replacement for the Acorn Disk Interface (Version A) and as a Second Disk Interface (Version B) adding to your existing interface. They all use the same Western Digital controller chip (WD1770).
Price £39.95 inclusive

DISK DRIVES:
3 models are being offered:
STL55A: 40 tracks single sided, SLT55F: 2 x 80 tracks, double sided and the best of mini floppy technology STL320: 2 x 160 tracks, double sided.
All disk drives are supplied with cables, formatter disk, head cleaning kit and 2 year warranty.

WHICH SIDEWAYS RAM DO YOU NEED?

Solidisk Sideways RAM is available in 16l (SWR16), equivalent to 1 sideways ROM, 32k (SWR32), equivalent to 2 sideways ROMs, 128k (Solidisk), equivalent to 8 sideways ROMs and the 208k Solidisk equivalent to 12 Sideways ROMs. You can buy a small Sideways RAM now and upgrade it later. From the SWR16 to the SWR32 is by straight exchange, from the SWR32 to the Solidisk is by adding the 96k Solidisk Extension, from 128k to 208k is by exchange of the RAM card.

FREE SOLIDISK SOFTWARE:

WORD64:
WORD 64 is a Service RAM, it uses Solidisk as storage for WORDWISE, up to 64K free characters for any text.

SILEXICON:
SILEXICON is a Spelling Checker for Solidisk. SILEX scans texts at more than a 1,000 words a minute and compares each word against the dictionary, Silexicon marks the mis-spelt words for either addition to the dictionary or eventual correction.

PRINTER BUFFER:
PRINTER BUFFER is a Service RAM, it increases 500 times the normal 32 bytes printer queue to 15K bytes, completely transparent to the user. PRINTER BUFFER is as useful for printing a long document as for a short program listing.

STLEOO:
STLOO is a Service RAM, it is Disk Filing System that leaves PAGE at &EOO, has built-in disk formatter/verifier and automatic track stepping for 40/80 track disk drives.

STL150:
STL150 is a Service RAM to enhance Acorn's .90 DFS to offer up to 150 directory entries per side.

STL-RFS:
STL-RFS (RAM/ROM filing system) is a Service RAM and an innovation in portable applications. STL RFS saves any program in a Sideways ROM format, it can then be copied onto EPROM to give instant recall of your programs. Plug this EPROM into any sideways socket, type *RFS and it runs itself. Compatible with the ELECTRON and BBC, tape and disks, SWR16, SWR32 and Solidisk.

INDEX:
INDEX is a Service RAM, it stores all the entry points of one or several sequential data files such as mailing list, stock list, accounts etc, merges, sorts them in alphabetical order and gives instant access to any record. INDEX can handle 1,100 records of any size, any type, any number of fields.

MACRO-BASIC:
MACRO-BASIC is a program generator. You use a wordprocessor to create a command file which is then scanned by MACRO. MACRO uses other programs, subroutine libraries, text files (actually any or all files on your disks) as source to generate a bug free BASIC program which can be very large (Megabytes are not the limit).

VIRTUAL MEMORY PROCESSOR:
VIRTUAL MEMORY PROCESSOR (VMP) uses extensively overlay technique and Solidisk as back store for very large programs that cannot be run otherwise. VMP uses the 32k basic RAM as transient area: it operates on a Main Program as generated by MACRO-BASIC, taking different segments from the Solidisk Store, POOL, HOLD, FREE or CLEAR segments from the transient area. For example: VMP will accept 20 segments of 10k of Basic assembler and assembles it into 16k of machine code.

MENU:
MENU puts all computer's resources at your fingertips. MENU displays your Sideways Firmare, Disk Directories, Sideways RAM system, Solidisk System etc.

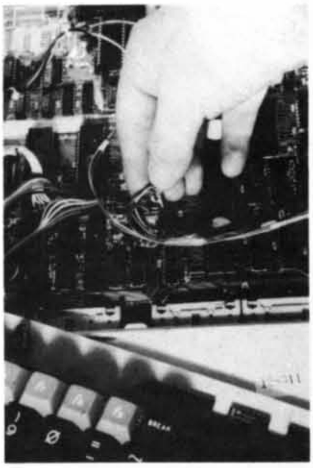
MORE FREE SIDEWAYS RAM SOFTWARE TO COME:

While others are making promises for software to be written, Solidisk Systems RAM comes with a complete, novel and powerful software package including compatibility with existing sideways software.
Each Sideways RAM is accompanied by the Sideways RAM User Manual, full 1 year warranty, 1 utility disc* and free mailing on all new publications from the Software Support Service.

*It should be understood that we cannot put as much free software on a 40 track single sided as on a 80 tracks. The present software package require 160 tracks of storage and can be accommodated on ONE 2 X 80 track double sided diskette, only the most useful programs are supplied on other formats (ie 40 track single sided, 2 X 40 track double sided, 80 track single sided). Should you require the whole collection of free software, please place an order for extra disks.
For the technical minded: the Source Code and Technical Manual (3 floppies and a 300+ page book) price = £10, the SILEXICON EXTENSION PACKAGE (3 floppies and a 40 page mnual, 30,000 word dictionary: English and French now, German and Spanish planned) price = £9.00. '4S' also publishes regular updated SWR utility discs at £3.00.
Every user can do contract work for the SUPPORT SERVICE and make a lot of money for him/herself!

HOW EASY TO INSTALL:

Push in the base unit



Connect the control wires

PRICE LIST (including VAT and post & packing)

SIDEWAYS RAM:	
SWR 16K	£43.65
SWR 32K	£59.95
128K SOLIDISK	£150.95
208K SOLIDISK	£243.00
The following are upgrade prices for existing Sideways Ram owners:	
16 – 32 (please return complete item)	£18.00
16 – SOLIDISK (please return complete item)	£109.00
32 – SOLIDISK (no return necessary)	£93.00
128K – 208K SOLIDISK	£93.00
DISK DRIVES:	
STL55A (40 track, single sided, cased with cables, diskette, manual and 2 years warranty)	£142.95
STL55F (2 X 80 track, double sided, as above)	£232.95
STL320 (2 X 160 tracks, double sided, as above)	£499.00
FLOPPY DISKS (DATALIFE Verbatim):	
MD525 (SS/DD 40 or 80 track) box of 10	£16.00
MD550 (DS/DD 40 or 80 track) box of 10	£22.00
MD557 (DS/DD 98 TPI) box of 10	£27.00
CPU CASE	£13.00
DETACHABLE KEYBOARD CASE	£27.99
EPROM PROGRAMMER (used with Sideways Ram)	£16.00
UVIPAC EPROM ERASER (free standing unit)	£20.95
2764 PACK OF 5	£36.00
SOURCE CODE + TECHNICAL MANUAL	£10.00
SLEXICON EXTENSION PCKAGE	£9.00

WE STOCK A LARGE RANGE OF PRINTERS AND MONITORS. CALL OUR SALES OFFICE FOR IMMEDIATE QUOTATION.

HOW TO ORDER?

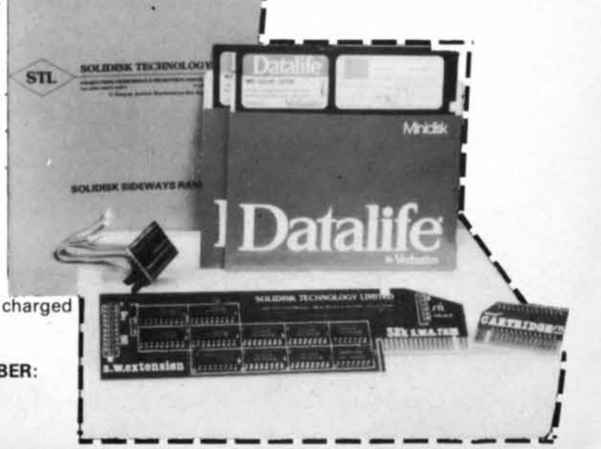
You can order any item using the coupon. Post and packing is only charged once.
Access and Barclay card holders can place their order by phone.
Educational authorities, Acorn dealers and OEMs can obtain quantity discounts.

Name:
Address: ....
....
....
Credit Card Account:

Callers are requested to ring first for appointment.

Total: £

If ordering more than one item, deduct £1 per item as post and packing cost is only charged once.



**SOLIDISK TECHNOLOGY LIMITED
17 SWEYNE AVE
SOUTHEND-ON-SEA
ESSEX SS2 6JQ**

**SOLIDISK'S NEW TELPHONE NUMBER:
SOUTHEND-ON-SEA (0702) 354674**
(10 lines with automatic exchange)

Half a box is better than one?

XLtron
XLtron
XLtron

25 s/s d/d disks + box £29
plus VAT and P + P

25 d/s d/d disks + box £39
plus VAT and P + P

50 s/s d/d disks + box £50
plus VAT and P + P

50 d/s d/d disks + box £75
plus VAT and P + P

We ran the advertisement opposite to move some stock left from a cancelled order. And move them it certainly did. We're still selling around 30 boxes a day, that's over 30,000 disks a month. So we bought some more, and are going to continue selling at the same price.

We also got a lot of people on the phone asking if we could supply slightly fewer disks, and as you see, we're now offering boxes in 25's as well.

Every order of 25 or 50 comes packed in the same rigid plastic storage box with four dividers, we've kept the same high specification and all disks carry our two for one guarantee.

To order, just clip the coupon below. Personal callers welcome.

We accept orders from all government bodies, schools, universities, libraries, armed forces etc. We despatch on receipt of an official purchase order.
If you can't raise a cheque without an invoice please post or telephone your order and we'll send you a proforma by return.

Disco Technology Limited, Lex House, 3/6 Alfred Place,
London WC1, England. Telephone 01-631 0255,

Take Advantage of us!

50 s/s d/d disks + box – £50 plus VAT + p&p
50 d/s d/d disks + box – £75 plus VAT + p&p

Please rush me
___(qty) storage box(es) filled with 50 s/sided disks at £59.50 each.
___(qty) storage box(es) filled with 50 d/sided disks at £87.25 each.
___(qty) storage box(es) filled with 25 s/sided disks at £33.65 each.
___(qty) storage box(es) filled with 25 d/sided disks at £47.15 each.
___(qty) empty storage box(es) at £11.
Prices include VAT and P + P. I enclose cheque for ______
or debit my Access card no. ______
Name ______ Signature ______
Address ______
______
Postcode ______ Telephone ______

MU/9

To: Disco Technology Ltd, Lex House, 3/6 Alfred Place, London WC1.

XLtron

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ATTENTION ALL BBC MICRO USERS!

Special Offer exclusive to Micro User readers!

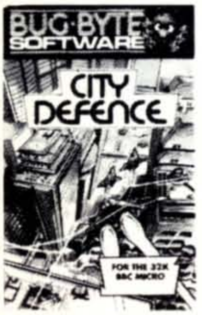
3 fantastic games for the price of one!

When you order your copy of our best selling adventure game "TWIN KINGDOM VALLEY" we will send you a choice of two other games for your BBC, FREE. A breakthrough in adventure programs, Twin Kingdom Valley will take you on an incredible journey through over 175 full colour, graphic locations to test your ingenuity to the limit.

BUG-BYTE
Twin Kingdom Valley
FOR THE 32K BBC MICRO

£9.50
+ 75p p&p

Choose any 2 for Free!


BUG-BYTE SOFTWARE
CITY DEFENCE
FOR THE 32K BBC MICRO

City Defence
Save your cities from wave after wave of missile attacks.
RRP £7.50

BUG-BYTE SOFTWARE
GALAXY WARS
FOR THE 32K BBC MICRO

Galaxy Wars
Feel the adrenalin flow as a simple mission turns sour.
RRP £7.50

BUG-BYTE SOFTWARE
FOR THE 32K BBC MICRO
OLD FATHER TIME

Old Father Time
Pit your wits against this traditional style text adventure ... mind blowing!
RRP £9.50

BUG-BYTE SOFTWARE
SEA LORD
FOR THE 32K BBC MICRO

Sea Lord
Things get rough when your mini-sub strays into the domain of a crazed dictator.
RRP £7.50

BUG-BYTE SOFTWARE
OBLIVION
FOR THE 32K BBC MICRO

Oblivion
One of the all time classic alien shoot-em-up games.
RRP £7.50

Offers available while stocks last.

Please rush me Twin Kingdom Valley for the BBC Micro.
I enclose Cheque/P.O. for £10.25 payable to Bug-Byte Ltd.
I claim my 2 FREE BBC games. Tick any 2 from the following:

City Defence ☐ Galaxy Wars ☐ Sea Lord ☐
Oblivion ☐ Old Father Time ☐

Name ....

Address ....

....

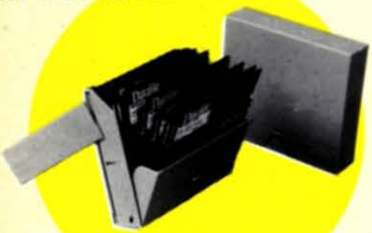
.... Post Code ....

Mail to: Bug-Byte, TKV Special Offer, Mulberry House, Canning Place, Liverpool. Allow 14 days for delivery. M.U.9

DISKING NEWS

We ship the worlds' best diskettes FASTER than anybody. We ALWAYS enclose a VAT invoice and current price list. It's not "Yes sir we're expecting delivery in 4-6 weeks" or "Please allow 28 days for delivery" – What rubbish we put up with in the U.K.?! Just ring another company in this magazine – we did. We purchased a modem advertised on another page – two months later we've still no modem OR explanation, AND we can't leave a message they've no answering machine! EVERTHING you see in this ad. is ON THE SHELF NOW. We despatch within FOUR working hours or we'll ship FREE!! Write or call (24 hrs) for our general price list. Coming soon:- The new Microdisk SEE 10 library box **PLUS** Disking Business Diskettes – They'll blow your mind.

FREE with EVERY ten-pack of diskettes from DISKING SEE 10 LIBRARY BOX



The award winning device for storing and displaying ten diskettes. Available individually at £2.50 exc VAT see under 'Diskette Storage'.

PLUS
DISKING COLOUR CODERS

A multicoloured pack of ten fibre tipped pens for colour coding your diskette labels available individually at 49p per pack of ten exc VAT.

DISKING SUPER PROMOTION FREE CLOCK VALUE £8.95

DISKING
FLOPPY DISKS
0428 722563

With every TWO Ten-Packs* of ANY 3½", 5¼" or 8" disks by Verbatim, Memorex, Dysan or Maxell purchased at these prices, we will pack a Super Disking Calendar Clock worth £8.95 absolutely FREE.

Order four Ten-Packs, and you will receive two Calendar Clocks and so on.

*Excluding diskettes purchased from bargain corner. All FREE offers are subject to availability.

MEMOREX

MEMORY EXCELLENCE

Memorex diskettes are everyones favourite, and work well in ALL computer systems.

5¼ INCH DISKETTES

Certified for single OR double density and with hub ring reinforcement

PRICES EXC VAT			10-40	50-90	100+
3481	S/S	48 tpi	21.90	20.90	19.90
3491	D/S	48 tpi	27.90	26.90	25.90
3504	S/S	96 tpi	27.90	26.90	25.90
3501	D/S	96 tpi	35.90	34.90	33.90

48 tpi suitable for 35 or 40 track operation
96 tpi suitable for 77 or 80 track operation
10 and 16 Hard Sector available at same prices

MEMOREX 3½" MICRODISKS – HERE AT LAST!

PRICES EXC VAT		10-40	50-90	100+
6100	S/Sided	42.90	41.90	40.90

0.5M Byte rating auto shutter
3½" library boxes coming soon

FREE

MEMOREX
MEMOREX dB 90

To celebrate three successful years with Memorex we are giving away a Memorex C-90 cassette tape with **every** ten-pack of Memorex floppies. This offer does not affect any of our other promotions, and is in adition to them.

DISKING

DISKING Means Business

NEW DISKING SWING LID BOX for 60 minidisks, comes with keys, dividers, tags and even built in carrying handles. At our price the best value around – Recommended Price £22.50.

D.S.L.B. – £17.90
buy 3 and get fourth one free. Post & Packing at 4 unit rate.

DISKETTE STORAGE

ABA lockable diskette storage comes in two sizes each for the mini disks and 8" disks. They hold either 40 or 80 diskettes.
M35 – 40 mini disk capacity £14.90
M85 – 80 mini disk capacity £18.90
F40 – 40 8" diskette capacity £18.90

SEE 10 LIBRARY BOX Free with every pack of ten diskettes this superb storage device keeps dust out, yet enables instant selection.

Part No.	Description	Price
SEE 10	Library Box	2.50
LB8	Library Box (not SEE 10 design)	3.00

DISKETTE ACCESSORIES

'PERFECT DATA' CLEANING KIT

The one that really works well in ALL drives – get it now before the gremlins strike.

Part No	Description	Price
CK5	For 5¼" disk drives	14.90

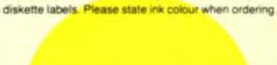
5¼" DISKING SUPERMAILERS

Very rigid copyright design, takes up to 4 disks.

Part No	Description	Price
DSM	100-pack mailers	24.90

DISKING DISKWRITERS

Packed in 25's and sold in 50's, these superb blue or black pens are 100% safe for use on diskette labels. Please state ink colour when ordering.



Part No	Description	Price
DW	50-pack Diskwriters	9.90

U.K. SHIPPING RATES INC. INS. BUT EXC VAT

5¼" or 3½" DISKETTES
1-2 packs each pack at 95p
3-5 packs each pack at 75p
6-9 packs each pack at 60p
10+ packs POST FREE

5¼" CLEANING KITS
same as 5¼" diskettes

5¼" SEE 10 LIBRARY BOXES
1-4 off at 40p each
5-9 off at 30p each
10+ off at 20p each

8" DISKETTES
1-2 packs each pack at 1.60
3-5 packs each pack at 1.20
6-9 packs each pack at 90p
10+ packs POST FREE

8" CLEANING KITS
same as 8" diskettes

8" LIBRARY BOXES
1-4 off at 60p each
5-9 off at 45p each
10+ off at 30p each

DISKING SUPERMAILERS
100-pack 3.00

LOCKABLE STORAGE (all versions)
1 off 2.00 each
2-7 off 1.30 each
8+ off POST FREE

DISKING COLOUR CODERS
25p each – 5+ POST FREE

DISKING DISKWRITERS
50-pack 1.00

Dysan

DYSAN – FOR THE DISCERNING

With new lower prices, Dysans impeccable reputation is now a genuine bargain.

5¼ INCH DISKETTES

Certified for Single OR Double Density. 48 tpi with Hub Ring reinforcement.

PRICES EXC VAT		10-40	50-90	100+
104/1D S/S 48 tpi	...	23.90	22.90	21.90
104/2D D/S 48 tpi	...	34.90	33.90	32.90
204/1D S/S 96 tpi	...	34.90	33.90	32.90
204/2D D/S 96 tpi	...	42.90	41.90	40.90

48 tpi suitable for 35 or 40 track operation
96 tpi suitable for 77 or 80 track operation
10 and 16 Hard Sector available at same prices.

8 INCH DISKETTES

PRICES EXC VAT		10-40	50-90	100+
3740/1D S/S D/Dens	...	32.90	31.90	30.90
3740/2D D/S D/Dens	...	40.90	39.90	38.90

32 Hard Sector available at same prices

maxell

MAXELL – THE GOLD STANDARD

Maxell's very high quality control ensures all standards are met and surpassed.

5¼ INCH DISKETTES

Certified for Single OR Double Density. All with Hub Ring reinforcement

PRICES EXC VAT		10-40	50-90	100+
MD1-D S/S 48 tpi	...	24.90	23.90	22.90
MD2-D D/S 48 tpi	...	32.90	31.90	30.90
MD1-DD S/S 96 tpi	...	32.90	31.90	30.90
MD2-DD D/S 96 tpi	...	42.90	41.90	40.90
MD2-HD D/S 1.6MByte	...	59.00	56.00	53.00

48 tpi suitable for 35 or 40 track operation
96 tpi suitable for 77 or 80 track operation

8 INCH DISKETTES

PRICES EXC VAT		10-40	50-90	100+
FD1-128 S/S S/Dens	...	29.90	28.90	27.90
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The world market leaders, with perfect data retention time after time – for a lifetime.

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Certified for single OR double density and with hub ring reinforcement.

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48 tpi suitable for 35 or 40 track operation
96 tpi suitable for 77 or 80 track operation
10 & 16 Hard Sector available at same prices

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FD34-9000 S/S S/Dens	...	31.90	30.90	29.90
FD34-8000 S/S D/Dens	...	31.90	30.90	29.90
DD34-4001 D/S D/Dens	...	36.90	35.90	34.90

32 Hard Sector available at same price

20-M BYTE HARD DISKS FOR YOUR MICRO

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Don't keep sitting there in front of your VDU, get outside and fly our aeroplane. Just call and ask for your flier, and we'll send you our latest trade pack with prices, special offers and sample unlabelled diskette and mailer. We'll also enclose a DPC application form telling you how to buy at our 10,000 prices yet order only in 50's.

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S/S 48 tpi Diskettes	13.90	12.90	11.90
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Don't be fooled – these diskettes are brand new and come with our normal full money-back guarantee. They are mostly non hub ring labelled or unlabelled BASF, Dysan, Rhone Poulenc, Memorex etc. where the boxes have had the cellophane removed. We are even supplying them in a FREE SEE 10 library box!! At these prices you can't lose – Hurry!

To: DISKING FREEPOST, Liphook, Hants, GU30 7BR, U.K

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Total Delivery and insurance ____
Sub Total exc VAT ____
VAT ____
Value of cheque payable to Disking ____

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Access, VISA & Diners Cards Welcome

The Graduate.

The first IBM PC compatible upgrade for the BBC model B micro.

From only £764.00 the new Torch Graduate will upgrade your BBC Model B to a powerful 16 bit business computer

TECHNICAL SPECIFICATION

- 8088 16-bit processor running at 5 Mhz
- 128K or 256K RAM
- MS™-DOS operating system customised to IBM compatibility
- Model G400 – Single, double sided, high density disc drive (320K formatted)
- Model G800 – Twin, double sided, high density disc drives (640K formatted)
- Integral stabilised power supply
- 2 IBM PC compatible hardware expansion buses
- Software compatibility allows Lotus 1-2-3 and all popular IBM PC business programs to run without modification, subject to the constraints of the BBC keyboard and display
- Disc interface is not required

Keyboard text and graphics supplied by BBC Model B

• THE GRADUATE •

Disc and hardware compatible with the IBM PC, the Graduate is the latest addition to the Torch range of BBC upgrades. It's MS™-DOS operating system is customised to IBM compatibility allowing exploration of the massive range of IBM compatible business software, programming aids, compilers and languages universally available from most major software houses.

Introduction to MS™-DOS

The Graduate offers two levels of upgrade, the G400 and the G800, both with 128K on board user memory as standard (optionally 256K). This can be increased to 1.2 Mbytes with an IBM compatible expansion board. The G400, contains a single, double sided 320K formatted disc drive and provides the low cost introduction to MS™-DOS for the user who wants real 16 bit power from his Model B.

More data storage

A step up from the G400 is the G800 which offers twin, double sided 320K disc drives for extra data storage. Both the G400 and the G800 provide the possibility of further expansion for networking, modems, etc., via the IBM compatible hardware slots provided by the Graduate models. Each model comes complete with a well written user/technical manual and connecting leads.

Just plug it in

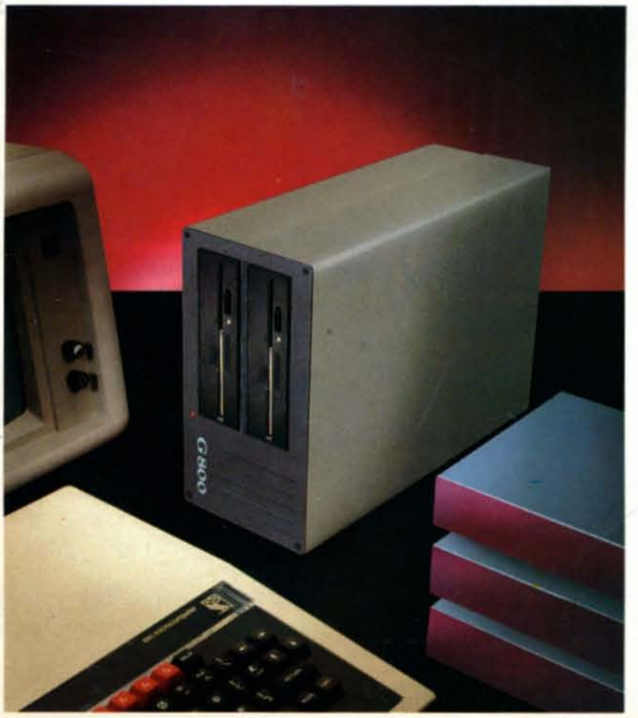
Unlike other add-ons there is no need to open the BBC to make the connection. The compact and tidy Graduate models simply plug in to the 1MgHz bus on the Model B. Within minutes you can be up and running with an IBM PC compatible system that really means business.

The range

Add 256K RAM, 640K disc storage and IBM PC compatibility to the BBC Micro for less than £1,000.

Graduate G400	(128K)	£764 inc. VAT
Graduate G400	(256K)	£815 inc. VAT
Graduate G800	(128K)	£949 inc. VAT
Graduate G800	(256K)	£999 inc. VAT

For further information complete the coupon today.



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Lighting the way ahead.

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Telephone (0223) 841000. Telex 818841 TORCH G.

The Graduate is manufactured by Torch Computers under licence from Data Technologies Ltd.

To: Torch Computers Ltd., Abberley House, Great Shelford Cambridge CB2 5LQ. Telephone (0223) 841000

Please send further information on the Graduate and the address of my nearest dealer.

Name ____________

Address ____________

Post Code ____________

Telephone ____________

MU9

Introducing BEEBUGSOFT

Until recently a very special range of applications and utility packages for the BBC micro has been unavailable to the general public.

This software has been produced by the BBC user group BEEBUG for its members. BEEBUG members tend to be a demanding and discerning group of individuals; and the range of software produced has been kept to a consistently high standard through their constant vigilance.

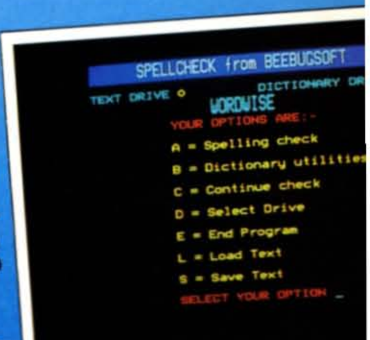
As a result, BEEBUG software is highly acclaimed amongst BEEBUG's 25,000 members. Independent reviews from the major computing magazines seem to take a similar view of the software, as you can see from their comments.

SPELLCHECK

The disc based spelling checker for text created on Wordwise or View.

"... invaluable ... fast and reliable ... a worthwhile investment"
PCN February 1984

Disc £19.00



```
SPELLCHECK from BEEBUGSOFT
TEXT DRIVE 0                DICTIONARY DR
               WORDWISE
          YOUR OPTIONS ARE:-
          A = Spelling check
          B = Dictionary utilities
          C = Continue check
          D = Select Drive
          E = End Program
          L = Load Text
          S = Save Text
          SELECT YOUR OPTION _
```

TOOLKIT

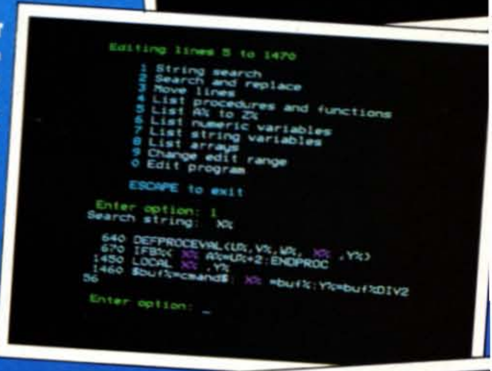
27 new commands in eprom to speed up Basic program development and debugging.

"... an indispensible aid"
EDUCATIONAL COMPUTING March 1984

"... worth every penny ... highly recommended"
COMPUTING TODAY June 1984

"... its range of utilities is excellent"
MICRONET May 1984

Eprom £27.00



```
Editing lines 5 to 1470

      1 String search
      2 Search and replace
      3 Move lines
      4 List procedures and functions
      5 List A% to Z%
      6 List numeric variables
      7 List string variables
      8 List arrays
      9 Change edit range
      0 Edit program

      ESCAPE to exit

 Enter option: 1
Search string:  X%

  640 DEFPROCEVAL(U%,V%,W%, X% ,Y%)
  670 IFB%< X% A%=U%+2:ENDPROC
 1450 LOCAL X% ,Y%
 1460 $buf%=cmand$: X% =buf%:Y%=buf%DIV2
56

Enter option: _
```

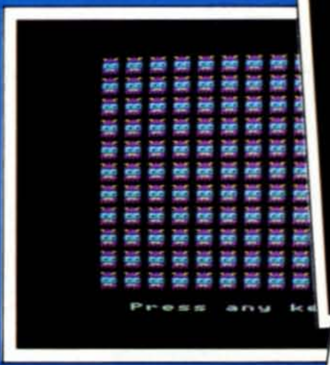
SPRITE UTILITIES

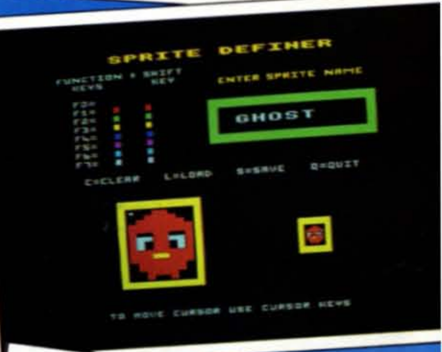
A game writers utility pack enabling high speed arcade games to be quickly written in Basic.

"... definitely recommended ... excellent"
ELECTRONICS AND COMPUTING May 1984

"... Sprite Utilities wins through"
ACORN USER May 1984

Cassette £10.00
Disc £12.00





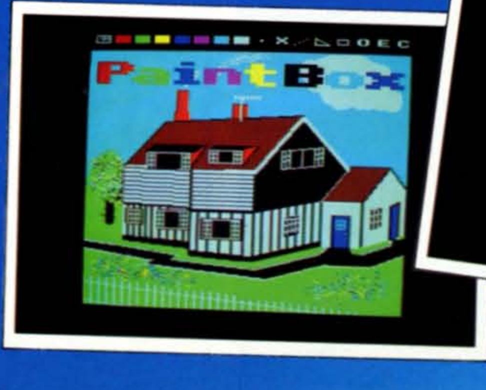
PAINTBOX

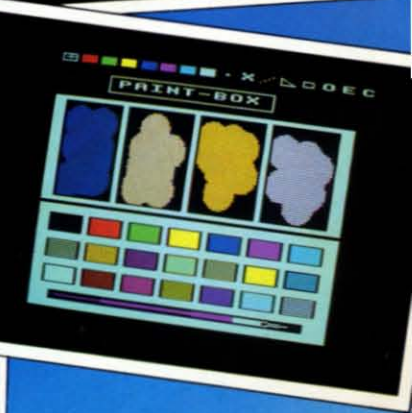
Probably the ultimate joystick drawing package on the BBC Micro, great fun and highly educational.

"... amazingly versatile ... easy to use ... (one of the most feature laden picture creating programs around) ... tremendous potential"
EDUCATIONAL COMPUTING Jan 1984

"... a very sophisticated and versatile utility"
ELECTRONICS AND COMPUTING May 1984

Cassette £10.00
Disc £12.00





KONG
HIGH SCORES
1. BEEBUGSOFT....5000
2. BEEBUGSOFT....4000
3. BEEBUGSOFT....3000
4. BEEBUGSOFT....2000
5. BEEBUGSOFT....1000
ss Space-bar to Play

HONEST JOE USED CARS
HONEST JOE
Would you buy a used car from this man?

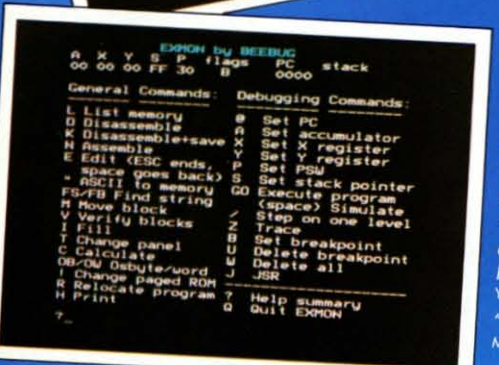
TELETEXT PACK

A powerful screen editor for quickly creating Teletext Mode 7 screens.

". . provides teletext editing facilities in a well thought out manner"
ELECTRONICS AND COMPUTING April 1984

". . a very neat utility"
MICRONET April 1984

Cassette £10.00
Disc £12.00



```
        EXMON by BEEBUG
A  X  Y  S  P  flags   PC   stack
00 00 00 FF 30   B     0000
General Commands:    Debugging Commands:
L List memory        @  Set PC
D Disassemble        A  Set accumulator
K Disassemble+save   X  Set X register
N Assemble           Y  Set Y register
E Edit (ESC ends,    P  Set PSW
  space goes back)   S  Set stack pointer
" ASCII to memory    GO Execute program
FS/FB Find string       (space) Simulate
M Move block         /  Step on one level
V Verify blocks      Z  Trace
I Fill               B  Set breakpoint
T Change panel       U  Delete breakpoint
C Calculate          W  Delete all
OB/OW Osbyte/word    J  JSR
! Change paged ROM   ------------------
R Relocate program   ?  Help summary
H Print              Q  Quit EXMON
?_
```

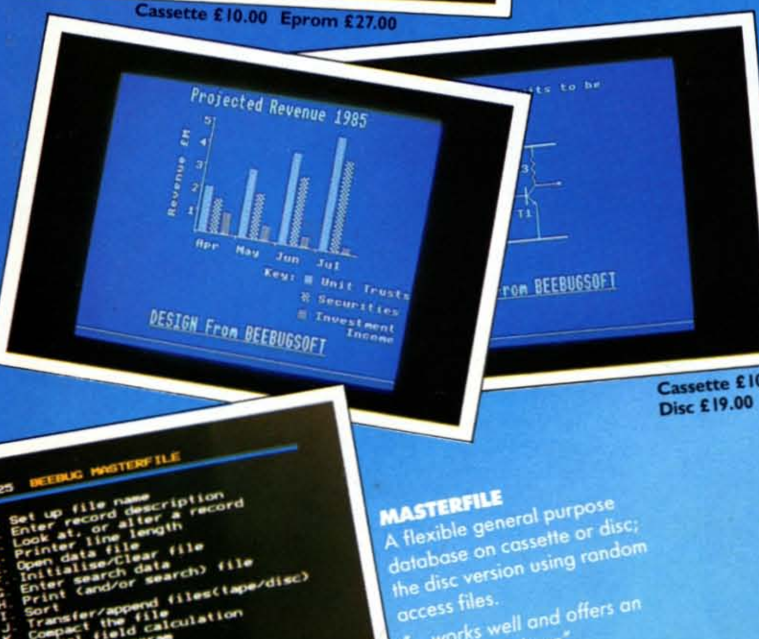
Cassette £10.00 Eprom £27.00

EXMON

An extremely powerful machine code monitor on cassette or eprom, offering 35 new commands for debugging machine-code.

". . exceptionally comprehensive . . . would be hard to improve upon"
YOUR COMPUTER August 1983

". . using EXMON is a delight"
MICRONET May 1984

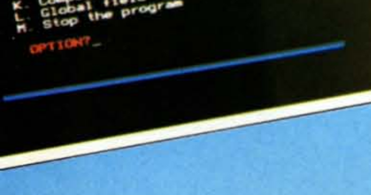

Projected Revenue 1985
Revenue £M
5
4
3
2
1
Apr
May
Jun
Jul
Key: Unit Trusts
Securities
Investment Income
DESIGN From BEEBUGSOFT
its to be
3
T1
rom BEEBUGSOFT

DESIGN

A Computer Aided Design package to allow screens to be quickly created for display, demonstration, handouts etc.

". . a first rate screen processor . . . immense value to schools and colleges"
EDUCATIONAL COMPUTING April 1984

Cassette £10.00
Disc £19.00



```
925  BEEBUG MASTERFILE

 .  Set up file name
B.  Enter record description
C.  Look at, or alter a record
D.  Printer line length
E.  Open data file
F.  Initialise/Clear file
G.  Enter search data
H.  Print (and/or search) file
I.  Sort
J.  Transfer/append files(tape/disc)
K.  Compact the file
L.  Global field calculation
M.  Stop the program

    OPTION?_
```

MASTERFILE

A flexible general purpose database on cassette or disc; the disc version using random access files.

". . works well and offers an efficient database"
PCN November 1983

Cassette £10.00
Disc £19.00

If you would like to know more about BEEBUGSOFT products, see the advertisers' index of this magazine, or telephone us for a full software brochure.

BEEBUGSOFT products may now be obtained from major dealers including selected branches of W.H. Smith.

Alternatively all products are available from us on mail order from our despatch department in High Wycombe.

BEEBUGSOFT dept 16 PO BOX 109
HIGH WYCOMBE BUCKS HP10 8HQ

TEL: ST. ALBANS (0727) 60263

Prices include VAT

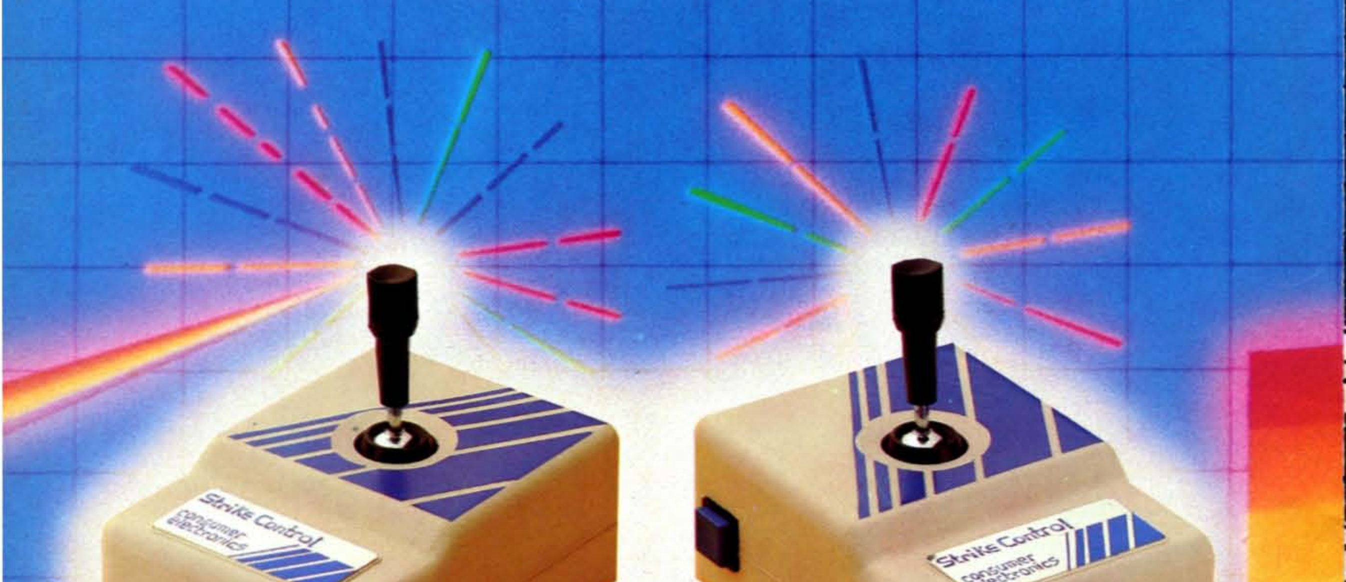
Strike Control
TWO PRECISION JOYSTICKS

- Set of 2 precision joystick controllers.
- Full analogue control with 2 potentiometers.
- Self centering.
- 2 responsive fire buttons positioned for maximum ease and comfort.

Compatible with *Acorn *BBC Model B Computers.

- Short, slimline joystick with thumbcup for sensitive fingertip control.
- Easy and comfortable to hold.
- Rubber feet for table-top use.

Strike Control
TWO PRECISION JOYSTICKS
consumer electronics


Strike Control
consumer electronics
Strike Control
consumer electronics

Strike Control is
available from most Spectrum and good computer shops.

consumer electronics limited
Failsworth, Manchester M35 0HS
Telephone: 061-682 2339

*Trade marks and/or trade names of companies concerned.

ABM on target

THE mysterious Acorn Business Machine range is still on schedule to make an appearance in September, according to a source close to the company's decision makers.

The ABM is said to be a full scale business micro incorporating integral screen, disc drives, and including "significant" bundled-in software.

As a late entrant to the competitive single-user small business market, its penetration is a matter of conjecture.

Even the price range produced a "no comment" response from official Acorn channels.

THE future of the BBC Micro has been assured for another four years with the signing of a new contract for its manufacture and distribution.

This is a setback for Sir Clive Sinclair's often expressed hopes of increasing his share of the educational market.

Commenting on the deal, Acorn's Chris Curry said: "The BBC Micro is, and will remain, the keystone of an expanding system, capable of meeting the needs of a wide range of users.

"Acorn, in association with the BBC, will be developing the system further to ensure it benefits from future technology, while maintaining its unique core of compatibility".

- Pictured signing the new contract are (left to right) Acorn founders Hermann Hauser and Chris Curry with Byron Parkin and Bill Cotton, managing director and chairman respectively of BBC Enterprises.

BEEB MARCHES ON MOSCOW

ACORN is poised to invade Russia following the announcement that the Western nations have lifted their embargo on sales of the BBC Micro to the Soviet bloc.

The company is currently aiming to secure a major share of the 8 bit Russian market which experts estimate will be worth up to 180 million US dollars over the next five years.

It has already allocated £50,000 to developing a Russian keyboard for the BBC Micro, Russian software and to translate all the technical manuals into Russian.

Spearheading the drive to win a contract for the BBC Micro and training and technical support in Russian schools is 3SL Overseas, Acorn's official Eastern European distributor based in Cheshire. One of their directors, David Pringle, has recently returned from the latest of a series of promotional raids into Russia to secure a foothold for the BBC Micro.

However Acorn expects to face fierce competition from Sinclair whose ZX 81 and Spectrum machines have also been cleared to be sold behind the Iron Curtain.

The Russian market has opened up as a result of the United States easing its stranglehold on Cocom – the coordinating committee controlling high tech trade with Eastern Europe.

While the Americans continue to dominate the organisation, which is made up of Nato member countries plus Japan, they have agreed to allow a number of "smaller" computers – including the BBC Micro – to slip through the net.

Networking

But as the United States holds to the line that almost all computers still have military applications – they claim that an Apple II can guide a Minuteman missile – they have insisted that those micros from which the embargo has been lifted cannot be sold with any networking capability.

Acorn International is currently attempting to get a formal ruling on just what this means.

Pet-BBC link

OWNERS of Commodore Pets who want to change to a BBC Micro can now do so – and keep their old printers and floppy discs.

The trick is done with an interface – the Syscon 6 – which links the BBC Micro to Commodore disc units and printers.

It connects to the Beeb's 1MHz bus and auxiliary power connector. The DFS and printer driver routines are supplied in an eprom which plugs into one of the sideways ROM sockets.

And the standard BBC disc upgrade is not necessary.

On-line Sprites

BBC Micro and Electron users who have a Simonsoft Sprites animation package (version 2) now have a programmers' hot line on 0235 24140. All questions will be answered on this number between 2pm and 3pm weekdays.

ACTION ON FALSE CLAIM

LEGAL action is being threatened by *The Micro User* over an inaccurate claim made on behalf of *Acorn User*. The claim is made by *Acorn User's* advertising agents, Computer Marketplace.

It appears in a letter to advertisers, accompanying a brochure announcing a 17.6 per cent increase in *Acorn User's* advertising rates.

The letter states that even with the rate increase *Acorn User* "has a lower cost per thousand advertiser figure".

"This is nonsense", said Derek Meakin, managing editor of *The Micro User*. "The truth is that *Acorn User's* advertising rate works out at £5.87 per thousand, while the rate for *The Micro User* is £4.38 per thousand.

"Instead of being cheaper, advertising in *Acorn User* costs a hefty 34 per cent more!"

..and China

ACORN International is on the verge of signing an agreement with a company in mainland China to manufacture and distribute the BBC Micro.

"We are a long way down the line to signing a contract", said sales manager Owen Maddocks.

Teacher goes home to a Beeb

THE classroom computer teachers switch off at the end of the day is more often than not the same model they plug in when they get home . . . the BBC Micro.

Forty-six per cent of computer-owning teachers have a BBC Micro – twice as many as own the next most popular model, the Sinclair Spectrum – according to a survey conducted by Educational Computing, a leading computer journal in education.

And a similar percentage of prospective teacher-purchasers intend to buy the BBC machine.

The survey of 35,700 schools and colleges indicates that BBC Micros will account for nearly two-thirds of new educational computer purchases during 1984.

It also uncovered the Beeb's consistently high standing across all types of institution – three-quarters of all schools and colleges have at least one, rising to a massive 84 per cent of colleges.

By comparison, RML's most popular model the 480 Z is used by 18 per cent of institutions and Sinclair's ZX-81 by 16 per cent.

Acorn managing director Chris Curry said: "The survey is important because it spans all types of schools and colleges.

"It results clearly demonstrate that the BBC Micro is the most important computer in education today, and one that is proving to be as valuable a tool in universities and colleges as in primary and secondary schools".

The survey also confirms in part a Department of Trade and Industry report that 83 per cent of orders under their "Micros in Primary Schools" scheme are for BBC Micros.

£1,000 software prize offered

A Hertfordshire micro dealer is staging a nationwide software contest with a £1,000 first prize. And they plan to market the winning program on a royalty basis.

Entries are expected to be mostly games, but other software can also be entered.

A spokesman for the dealer, County Computers, said: "We think there are still lots of people out there who can write very good games, but have little chance to get into the business".

Entries should be written for the BBC Micro, Electron, Spectrum or Commodore micros. Runners up in the contest will receive prizes of £200, £100 or cash vouchers.

There is no age limit, but under-18s must have a parent's signature.

Entry forms are obtainable by sending a stamped, addressed envelope to County Computers, 13 Bucklersbury, Hitchin, Herts. Closing date is September 14.

Make a micro quilt

THE BBC Micro is now being used to replace hours of tedious drawing and colouring-in by patchwork quilt designers.

Patchwork design – now a booming hobby in Britain – has countless evening classes, books and TV programmes devoted to its mysteries.

Hard line patchwork addicts are members of the 2,000-strong Quilters Guild. But there are also thousands of quilting freaks in local groups, and still more working alone.

Each region of Britain has its own traditional patterns, with other designs coming in from Scandinavia and the USA.

Now a Hampshire quilter, Mary Hewson, has developed a package for the BBC Micro called Patbuild.

It lets the designer try out the effect of distortions, repetitions and various colour combinations – all in a fraction of the time it takes with pencil, ruler and felt tips.

SEVERELY disabled Mark Simmons, 19, has just been offered a full-time job as a systems trainee by Nottingham County Council.

Mark, a member of the BBC Micro club at County Hall, started in computing last October.

He joined a government sponsored Threshold course run by Control Data Institute. Later, after basic training in data processing and Cobol, he spent nine weeks in Nottingham County Council's management services department.

PRESTEL HEADS FOR THE CLASSROOM

PRESTEL, the British Telecom viewdata service, is launching a new education service for schools – and the BBC Micro will be playing a leading part.

The Department of Trade and Industry, recognising the importance of information technology to schools, is helping to fund the new service.

Schools will be able to subscribe to all the regular Prestel features along with special educational microcomputing applications by converting their micro into a Prestel terminal.

The service is aimed at Britain's 7,500 secondary schools – many of whom have selected the BBC Micro – and local education authority teachers' and advisory centres.

It has been developed with the Council for Educational Technology (CET) for the UK.

The Department of Education and Science-funded Microelectronics Education Programme, the Scottish Council for Educational Technology and other educational organisations are also contributing to the new project.

The Prestel Education Service is due to start next January. Special features will include:

- School Link, an educational microcomputing service allowing schools to receive telesoftware programs direct from Prestel down the telephone line.
- Advice, support and ideas to enable schools to develop their use of information technology.
- Information on career opportunities.

BOOST FOR MENTAL ARITHMETIC

IF you thought mental arithmetic for kids was a thing of the past, think again. Griffin Software is staging a rescue operation for youngsters who want to turn two plus two into four without using their calculators.

Available for use on the BBC Micro, Mental Arithmetic is a software package for over-eights providing practice in basic numeracy with two programmes, an individual test and a class test.

Between 10 and 20 questions can be selected in each test, with up to three levels of difficulty.

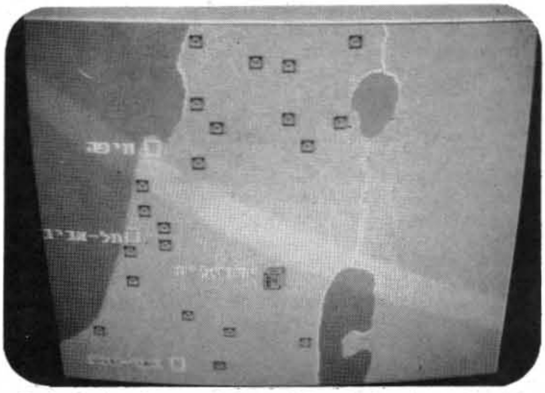
Three other new titles for the BBC Micro from Griffin are aimed at helping students understand maths concepts often difficult to grasp in a classroom situation.

Tested

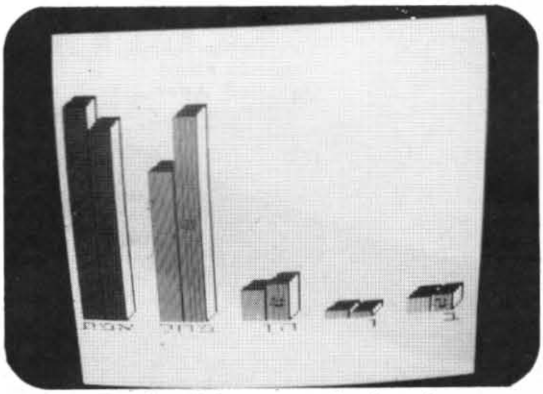
Designed for students aged 10 to 16, the packages cover fundamental algebra, Pythagoras' theorem and basic trigonometry.

Each title has been written, evaluated and tested with the help of teachers, according to Griffin, and contains full instructions and record sheets to help monitor progress.

BBC Micro chosen to cover Israeli elections



Beeb-produced map of Central Israel showing main cities and locations where a sample poll was to be taken



How Israeli viewers saw a barchart of projected '84 results versus '81 results

A HANDFUL of BBC Micros stole the show during Israel TV's marathon coverage of the country's election results.

They were used to bring up-to-the-minute election night details to a nationwide TV audience – and they were chosen for the job over other systems costing up to 10 times as much.

The BBC Micros were used in two ways.

Israel's top statistician wrote a program to analyse a sample poll at 35 polling stations on election day.

These figures were used to predict the outcome some five hours before the final results – with over 95 per cent accuracy.

Then the election results were translated into graphs and pie charts by a BBC Micro as they came in from a government mainframe.

The graphs were displayed to the TV audience to show the changing fortunes of the 27 parties as the night wore on.

In the search for the best computer to do the job, TV producer Rafi Ginat travelled to Europe and the United States. He was offered systems costing from £10,000 to £30,000.

But in London he found that the BBC Micro offered good colour graphics and data communications for a few hundred pounds. He learnt, too, that BBC engineers had dreamed up a device to connect the BBC Micro to the video equipment used in TV studios.

And Hebrew software was available, because the micro is widely used in Israeli schools, as well as Jewish schools in the UK. It is exported to Israel by Aldoda Ltd of London and Tel Aviv.

Israeli companies use the BBC Micro for their business communications with Britain and the US.

With a BBC computer plus electronic mail service, companies and news services can save a hefty slice of their international phone and telex bills.

And in a related field, Israel Instructional TV uses BBC Micros with its teletext service, itself based on the BBC's Ceefax and ITV's Oracle.

Hectic meeting between Israel Television and Aschola staff to prepare for election night

Micro soccer starts rumpus

THE cloistered peace of a respected academic institution was shattered recently when students nearly came to blows over a computer game.

They were playing Qual-Soft's soccer strategy game, "League Division One" as part of a computer appreciation course.

But these students also happened to be apprentices from two rival football clubs, Swindon Town and Reading, on day release at Swindon College.

Passions ran high as the students argued the best strategy for the game, which simulates the problems of a football manager as he steers his team to the championship.

Fists were clenched and voices raised as the youths split into opposing factions. Fortunately, reason prevailed before the threatened outbreak of soccer hooliganism.

The session ended in a spirit of friendly co-operation, with team spirit fully restored.

When contacted, a spokesman for the college laughingly dismissed reports of a full-scale riot in the classroom. And according to lecturer Brenda Lawton, who choose the software, the soccer game was the high spot of the whole course.

League Division One is available for the BBC Micro and an Electron version is also due soon.

NEW AT THE ELECTRON & BBC MICRO USER SHOW

Card offers complex colour displays

LATEST product from Cambridge Microcomputer Systems (CMS) is a high performance, low cost colour graphics card allowing 512 × 256 pixel resolution and an 85 × 32 character screen.

Shown for the first time at the show, the board, coupled with the CMS 6809 universal controller card, is designed to meet the increasing need for colour display of complex technical processes on the factory floor.

Said a spokesman for the company: "We envisage the software for the card being developed on a BBC Micro using our 6809 second processor.

Simple

"The development system costs less than £500 and includes PL9, the ideal applications language for this type of product. It's fast, simple to learn and easily rommed".

The graphics board, complete with 64k DRAM, supports four colour planes, hardware vector and character generator and an internal light pen facility.

CMS also unveiled their IEEE Talker/Listener Controller and a 6502 version of their universal controller.

WATFORD REVEAL THEIR SECRET

WEEKS of intense speculation and interest ended when Watford Electronics revealed their latest product – an add-on ROM/RAM card for the BBC Micro allowing up to 128 sideways ROMs to be added externally and 15 internally.

It was one of the star attractions at the July Electron and BBC Micro User Show, held at Alexandra Palace.

Called Apex, the minimum system consists an internal card for 15 paged ROMs – either 2, 4, 8 or 16k eproms.

With the Apex control ROM fitted 11 of the sockets can be configured for 8k RAM chips, giving in effect an 88k RAM disc.

The control ROM also allows the 128 extra sockets to be added via a ribbon cable and IDC connectors in cards of 16 at a time, distinguishing between each external device either ROM or RAM. Filled entirely with RAM, the system supports over 1mbyte of memory!

Despite the power and complexity of the system, Apex uses only four zero page locations, having its own onboard 2k battery-backed workspace.

This means that ROMs requiring large amounts of private workspace should be on the internal board, whereas more standard ROMs such as word processors can be part of the external system.

Apex uses power saving techniques to ensure that only the socket selected has current, so eliminating overheating.

The internal board can be fitted without any soldering, the card plugging into the 6502 and 8271 sockets.

The latter point was to enable the second of Watford's new products launched at the show to be fitted – a dual density version of their DFS that will allow up to 360k storage on a single disc surface.

Based on the Western Digital 1770, the code features a complete 8271 emulator that allows the DFS to recognise and work with both single and dual density discs.

Watford will be allowing people upgrading to Watford 1.4 DFS, as it is known, to trade in their old, and rather scarce, 8271 chips, thus keeping the costs down to around that of the standard DFS.

ACORN
MICRO USER
MICRO OLYMPICS
TORCH
No.1

Lunch break programs win road safety prize

A TRIO of 15-year-old girls who sacrificed their lunch breaks for a month to write a BBC Micro program had their self-inflicted hunger pangs rewarded when they were named as winners of a major contest.

For they provided the best electronic answer to keeping death off the roads in the Greater London Road Safety Contest sponsored by Database Publications.

Karen Dyerson, Angela Moran and Sarah Finucane – all fourth year pupils at Holy Cross Convent School, New Malden – put their heads together at noon each day to come up with "Big Feet", the winning entry.

Incorporating the slogan "When you Wanna Cross the Road Use the Green X Code", the program was selected as the outstanding example of how to use computer graphics to achieve maximum impact.

"We were most impressed with the quality of all the entries which came from schools throughout the Greater London area – but this one really stood out", said Alan McLachlan, a road safety expert and chairman of the judging panel.

The girls, accompanied by computer studies teacher John Downing, were guests at the opening day of the show where they were presented with a Pace disc drive as their prize.

"We were particularly delighted to have won because we have only had computers at the school for a year", said John Downing.

"What is even more pleasing to us is that we are a secondary modern school hemmed in by two grammar schools in New Malden – and they didn't get a look in".

As a result of their success, Karen, Angela and Sarah have all decided to stay on at school to take computer science at A level.

Following the prize presentation by Derek Meakin, chairman of Database Publications, the girls were treated to a slap up lunch at the show.

A big cat guards the Show star

AN exotic security operation was mounted when an internationally famed gold artefact, the "Jewelled Hare of Masquerade", was transported across London.

The £30,000 work of art was moved from a city bank vault to Alexandra Palace around the neck of a snarling jaguar – jungle wildcat variety. Once safely there it went on display during the four day Electron and BBC Micro User Show.

Girl with problems . . . the Jewelled Hare and its guardian

Aussies were there

THE market for the BBC Micro is blossoming Down Under.

So much so that distributors from Australia and New Zealand flew in specially to attend the show to see for themselves the latest developments on the scene.

Said Sue Dyson, representing an Australian distributor: "Acorn have sold at least six to seven thousand BBC Micros in Australia and the market's growing.

"However people feel frustrated that they can't readily obtain the products they see advertised in *The Micro User* – and until recently, even the ones that were imported were heavily taxed".

Such is the interest in New Zealand that distributors there are considering setting up their own UK company aimed specifically at exporting to the antipodean market.

Safety interface

A VERSATILE interface module that's claimed to totally protect your BBC Micro from damaging "electrical feedback" was launched at the show by Pilot One.

The unit, which features four opto-isolated inputs and four 0.5 amp relay driven outputs is said to be totally isolated from the BBC Micro – not even sharing a common ground line.

It also incorporates its own 5v 1 amp regulated power supply to drive projects without using the BBC Micro's own PSU.

The Pilot One interface, complete with software, costs £60.

Winnie from Pace

NEWEST hard disc on the market comes from Pace, who used the show to launch their own Amcom Winchester drives.

Pace forsee a major application of drives acting as file servers for their E-Net system – a product that's already creating great interest in educational circles.

Said managing director Barry Ruberry: "The nice thing is that E-Net uses standard Econet interfaces, so users who have Econet level one can upgrade to Amcom Winchester plus E-Net without any problem".

ENTER THE HARD ROCK BEEB

MUSICALLY minded BBC Micro owners will be able to compose music and then play it back over digital synthesisers thanks to a new interface from Electromusic Research.

Although synthesisers have long had a standard interface – the MIDI (Musical Instrument Digital Interface) – this could not communicate with the BBC Micro.

The Electromusic interface will allow two way communication.

What this means is that with suitable software, not only can the BBC Micro owner compose music on his micro, but he can play a tune on a synthesiser and have the notes appear on his screen.

The system, which created tremendous interest when demonstrated on the City Music stand, sells at around £159.

USE FOR THE ASHTRAY

ON sale for the first time at the show, the Viglen sideways ROM cartridge system proved to be a best seller.

The package allows you to plug sideways ROMs in and out of your BBC Micro at will, without having to open the case or turn the power off.

It works by running a ribbon cable from the sideways ROM sockets to another socket fitted in the "ashtray" to the left of the keyboard.

Handicaps beaten by Beeb mike researchers

CHILDREN with speech defects are receiving therapy by playing voice-controlled games on the BBC Micro.

Joint research by Manchester Polytechnic and the North West Computer Club has come up with Micromike, a modified CB radio microphone used to control computer games of varying complexity.

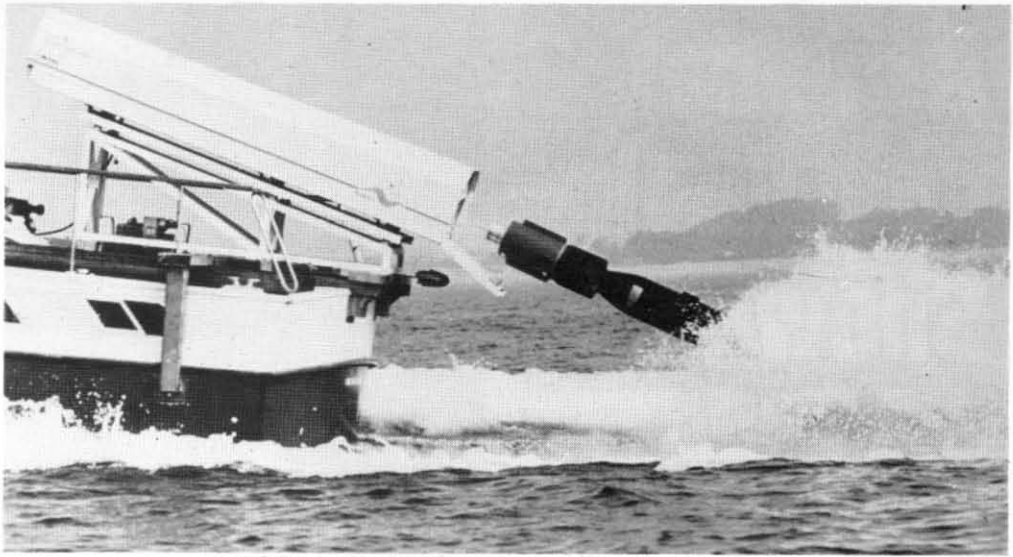
According to Bob Dyke of the Polytechnic's Special Education Micro Electronic Resource Centre (Semerc), some of the games are played through whispers and shouts.

Others are controlled by timing – for example, the player might have to cry "Shoot!" to zap an alien.

Other games are controlled by using certain vowels and consonants, so speech therapists can prescribe different games for different handicaps.

Micromike can be adapted to operate any single-key input program. Dozens of programs are available, and the device also comes in a desktop version for people who cannot hold a microphone.

Semerc is now working on an assortment of switches for the severely handicapped.



Kingfisher ... the containerised compact Sting Ray launch system

Now BBC Micro gets its calling up papers!

THE BBC Micro is helping develop underwater weapons for the Royal Navy.

Defence contractor Marconi Underwater Systems uses it in the analysis of existing weapons and the development of future ones. This includes the latest torpedoes Sting Ray and Spearfish.

So far, Bedford-based Broadway Electronics has supplied four BBC Micros and associated peripherals. They are used to create a computer link between Marconi factories in Wembley and Portsmouth.

More computers are to be installed and used in a network system.

Apart from day-to-day project management and scientific modelling, the equipment is used to analyse the forces and stresses which affect torpedoes during launch.

This involves a data logger which records the position and velocity of the weapon.

This data is retrieved, using the BBC Micro and an ordinary commercial interface. Analysis is then carried out on the BBC Micro or the data can be transferred to a mainframe.

A Marconi spokesman said Broadway was the only company who offered a complete system including installation, commissioning and backup services.

Paul Vaughan, managing director of Broadway Electronics, said: "This illustrates the power of this well-known home computer. It also means we can be proud of offering industry a really in-depth service."

Broadway is part of the newly-formed Mushroom Computer Group, specialising in add-ons for Acorn and Electron computers for business, commercial and educational uses.

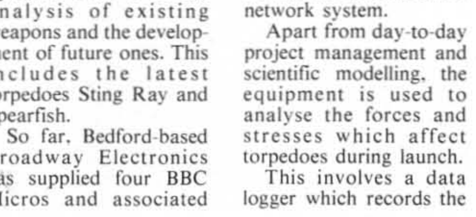
The year of the mouse...

THIS year will be remembered as the year of the mouse, according to Nick Pearson, sales director of Advanced Memory Systems of Warrington.

His firm has devised a mouse for the BBC Micro which is being unveiled at the Electron & BBC Micro User show in Manchester at the end of August.

A mouse is a tethered electronic box that you roll over your desk like a Dinky toy. This action moves the cursor around the monitor screen of your micro.

The mouse also has push buttons for entering commands.



Says Pearson: "A mouse is not just a nifty way of moving the cursor. It is more like light pens or bit pads than cursor keys. And it's amazingly easy to use".

According to Pearson, the mouse offers BBC users a whole new approach to working with computers. It also offers them ikon technology.

Ikons are little graphic symbols which represent the services on offer from your micro.

For example, a picture of a filing cabinet represents a file, and if you point the cursor at a picture of a waste bin, you can use it for getting rid of information you have finished with.

The AMS mouse comes complete with ikon software, but it also works with present BBC software, making it quicker and easier to use – especially for games and word processing.

The price is expected to be around £80, and Pearson is anticipating sales of between 1,000 and 2,000 units a month.

With first deliveries planned for October, he expects to supply 5,000 or more during the run up to Christmas.

DISC DRIVE DOCTOR

DISC drive maintenance is now offered direct to all BBC Micro users by Alpha Disc of Egham, Surrey.

The company offers micro users a direct fixed price basic alignment and recalibration for their disc drives at £20, with the job completed in one week.

"Most drive failures are in this category", says director Jon Pavitt, "and we know how to deal with them simply and quickly.

"We suggest owners either take their faulty drive to their dealer and ask him to contact us, or send it direct to us in protective packaging".

Beeb is flying high

A BBC Micro is at the heart of a prize-winning flight simulator program devised by a Manchester University lecturer.

Dr Bert Bloy, who teaches aeronautical engineering, won a £200 prize in a recent Royal Aeronautical Society contest for a cheap but realistic flight simulator.

It imitates a Cessna training plane, which the pilot controls with a joystick, plus two slide inputs for throttle and flaps.

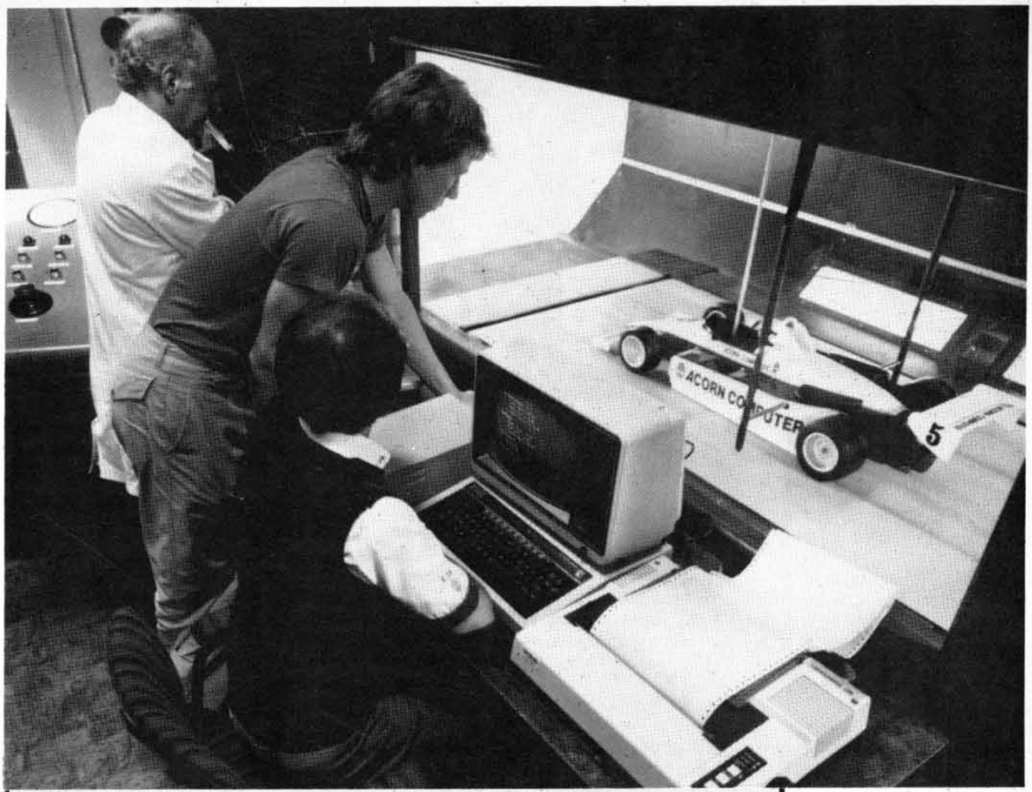
An unusual feature is that the joystick has built-in "feel". And the space bar can be used as a trimmer to take excessive fore-and-aft loads off the stick.

Instruments are artificial horizon, directional gyro and vertical speed indicator. Air speed and height are shown by digital readouts.

As an aid to landing green lights show the pilot when he is on the glide path, with a red warning light if he gets too low.

But Dr Bloy feels he still has some way to go before his program is perfected.

There is no rudder control as yet, and at present the program simulates landing only. "I am still working on it, and I hope to achieve a complete circuit soon, from takeoff to landing", said Dr Bloy.



Acorn gets wind up

A BBC Micro is being used in wind tunnel tests at Southampton University to improve the performance of aircraft, racing cars and other motor vehicles.

Benefiting most recently from this facility was Acorn's own Formula 3 Ralt racing car which is driven by David Hunt, younger brother of former world champion, James Hunt.

The wind tunnel enables engineers to measure the aerodynamic forces operating on the racing car.

To simulate normal race circuit air conditions a 200 horse power fan blows air over a detailed one/third scale model of the car, while a moving belt under the wheels simulates the ground effects of travelling at speed.

Significant

As a result of the wind tunnel testing Acorn expects to achieve a 40 per cent improvement in the aerodynamic design of the car which should result in a significant increase in speed and cornering potential.

Work on the Acorn car at the University's Department of Aeronautics' wind tunnel will continue into the season alongside work for the Brabham Team which won the recent Formula One Grand Prix in Detroit and Montreal in the hands of current world champion Nelson Piquet.

Pirates get their cards

RISING Edge Data (RED) has patented and started making a system they claim will stop software piracy.

The system uses a card like a credit card which is magnetically coded with key data, different for each program.

A card will be given away with the program, which will not run without it.

The other half of the system is a card reader initially available for the BBC, Spectrum, Commodore 64 and Atmos. This can be left plugged into the back of the micro. Other add-ons plug into the back of it.

The cost of the card reader will be on a par with the average price of software, although some companies may decide to give away the reader as a special offer.

The advantages to the end user might include a fall in the price of software when the manufacturers increase their sales.

LANGUAGE SERIES IS EXTENDED

FOUR new titles for the BBC Micro have been announced by Acornsoft, the software publishing side of Acorn Computer.

They are S-Pascal, Turtle Graphics, Lisp Demonstrations and BCPL Calculations.

S-Pascal, a subject of the popular programming language Pascal, has been specially developed for education.

It compiles directly to 6502 machine code and is said to be ideal for writing small, fast utilities. Library routines allow use of graphics and access to operating system commands.

Turtle Graphics offers the turtle drawing commands of the Logo language, making an introductory package for teaching elementary geometry, maths and graphics.

Patterns

The "turtle" is an imaginary creature. Controlled by the user, it moves around the computer screen leaving a visible trail from which patterns are built up.

The Turtle Graphics interpreter supports a subset of full Logo, sufficient to construct quite complex programs with arithmetic operations, loops, procedures and keyword abbreviation.

Lisp Demonstrations contains a set of 11 easy-to-use example programs written in the artificial intelligence language, Lisp.

Applications include computer graphics, the compilation of computer languages and artificial intelligence.

BCPL Calculations comprises a set of calculation files and example programs for use with Acornsoft's BCPL language system.

Three sets of calculation procedures are provided – floating point, fixed point and fast integer – to meet a wide range of applications.

Prices range from £10 to just under £20. All except BCPL Calculations are available on disc.

Acorn poised for boom

A ROSY future for Acorn is forecast by stockbrokers Henry Cooke, Lumsden and Co, who recently hosted an information technology forum at the National Computing Centre.

They say Acorn's pre-tax profits for 1984 should be around £11 million. Next year the figure is likely to rise to between £15 and £20 million.

In an eight page review, HCL analyst James Warhurst forecasts good general progress for Acorn, but puts a question mark over the future of the BBC Micro's assault on the US education market.

"Without the backing of a large US corporation and against powerful indigenous competitors, the chances of success are limited", says Warhurst.

But he sees better prospects in developing countries, notably India.

In European markets he highlights Germany and Spain as the best likely customers for educational products.

Inside one of the mobile classrooms

Micro goes on tour

THE BBC Micro is being taken on a tour of the country to meet the computer sales staff of W.H. Smith.

The firm found it impossible to train its nearly 1,000 computer salespersons at its Oxfordshire staff college, so it has equipped two £30,000 mobile classrooms to do the job.

Walk right in for all the answers

BBC Micro fans in the North will have a chance to quiz the experts at a walk-in forum in Manchester.

It's just one of the star attractions at the North's own Electron and Micro User Show, now back at the Renold Building, UMIST, Manchester.

The show runs from Friday, August 31, to Sunday, September 2.

As well as getting to see everything that's new in hardware and software for the BBC Micro and Electron, you'll be able to hear talks by the writers whose articles you read in *The Micro User*.

You won't need an appointment or a special ticket – just wander in and sit down. It's an ideal opportunity to listen to the experts – and to join in the fact-filled question-and-answer sessions.

Launch

Scores of firms will be displaying their new products – many for the first time in public.

Everything on show will be for sale – often at special low show prices.

Latest to announce a launch at the show is a Warrington firm which has developed a mouse for the BBC Micro.

And the Department of Trade and Industry will be on hand with its travelling Information Technology road show.

All in all, it promises to be a rewarding day out for all BBC Micro and Electron users.

FOLLOWING the Manchester event, two more Electron and BBC Micro User Shows are being held in London this year.

We return to Alexandra Palace for our big autumn spectacular from October 25 to 28, which will see the unveiling of lots of new products.

Then it's back to the New Horticultural Hall in Westminster for our Christmas show, from December 6 to 9.

And more shows are now being planned for next year to satisfy the ever-growing demand.

BARRY WOOD'S TAILPIECE

I WOULDN'T say that Andrew Bray – the whiz kid who wrote the Watford DFS and part of the Advanced User Guide – has made a lot of money out of it, but rumour has it that he's just started an accountancy course in order to keep track of it all . . .

★ ★ ★

TALKING about Watford, one of the puzzles of our Alexandra Palace show was solved for me by Kevin Edwards, newest recruit to our Technical Advice team.

Why, I wondered, would anyone want to have Watford's new system that allows you 128 sideways ROMs in a single board?

"Easy", said Kevin, "it's so you can have all the versions of the Watford DFS in one micro".

★ ★ ★

BEST question of the show as far as the Technical Advice Stand lads were concerned was the anxious: "What exactly is this Mode M you lot keep going on about?"

★ ★ ★

MIKE Cook was the star of the Technical Advice Stand once more. I really must scotch those vile rumours that all the exposure has gone to his head – he's still the same unspoiled lad who'd sell his autograph to anyone.

Mind you, I think he's out of favour with our beloved features editor, who was heard to mutter, as he collapsed exhausted in the hotel bar, "All that body building, and he still can't carry his own luggage".

★ ★ ★

WHILE on the subject of the features editor, he took us all by surprise by shaving his beard off just before the show.

At first we thought it was so he could have his photo in the magazine like Mike Cook. Then we decided it was so that people who unwisely took his advice at the last show wouldn't recognise him when they came to exact retribution at the latest event.

All was revealed, however, when he offered to buy a round of drinks for us.

Then we realised why he'd done it. He looks so young and fresh-faced without the fungus the barman refused to serve him!

★ ★ ★

NOTICE how the old squirrel abuser has been gaining great satisfaction from pornographic software recently?

The only thing he failed to reveal is that it has been rommed – courtesy of a non-pseudo user group.

And how do you call it?

**FACORN, of course!*

★ ★ ★

WELL, Imagine have gone the way of all flesh, and I think I know why.

Remember all those stories in the press and on TV about 18-year-old kids driving Jensens and earning £35,000 a year?

It's obvious, they were so busy giving interviews they never had time to write any programs . . .

★ ★ ★

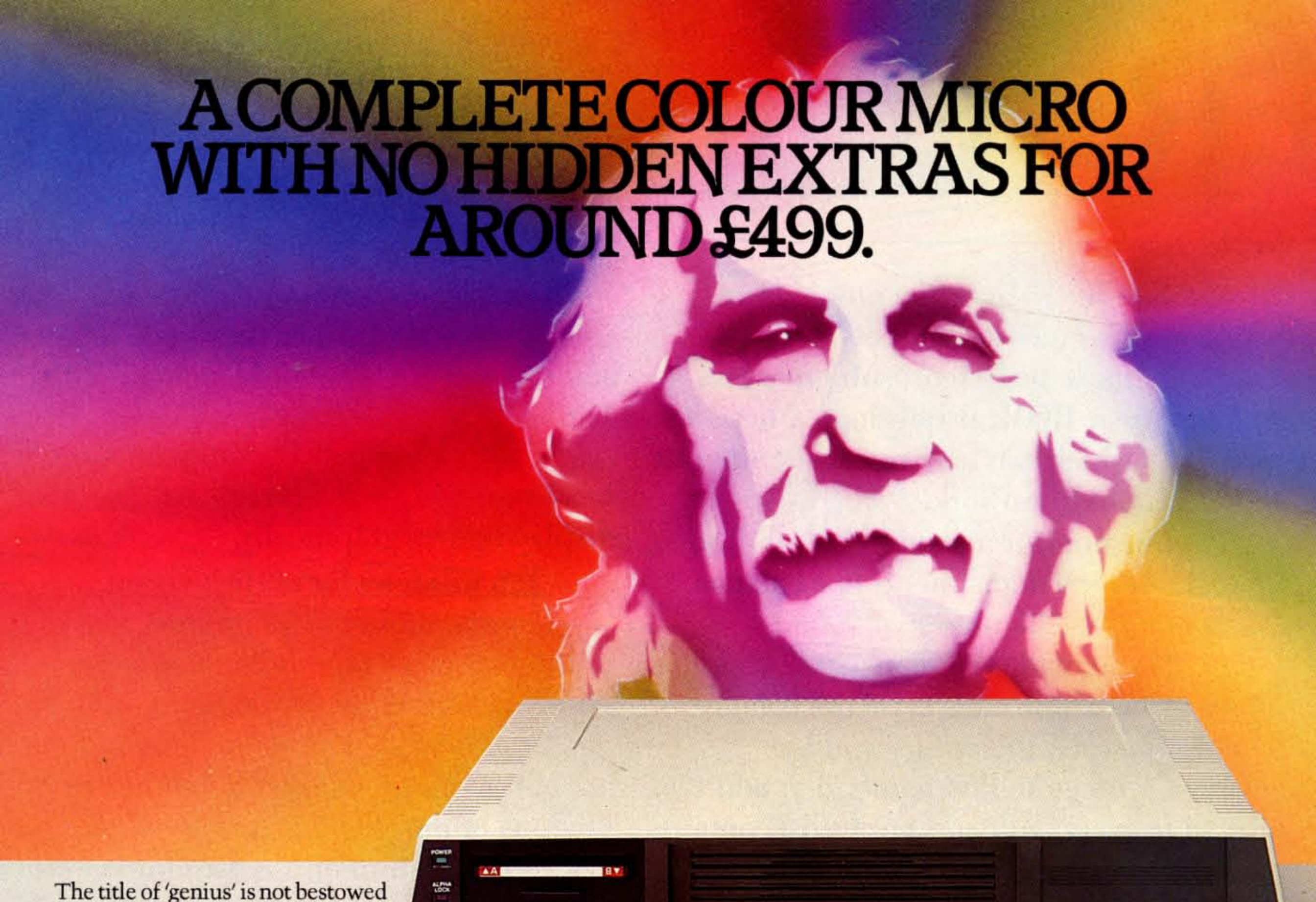
I WOULDN'T want to imply that the squirrel factory are threatening legal action against a lot of people, but one of their programmers has revealed they're working on a ROM-based writ generator.

★ ★ ★

I NOTICED the mag for squirrels has done it again. Last time they printed two blank pages, this time they've remembered the listing, but they've printed it upside down.

It was headed: "How to correct program listings".

A COMPLETE COLOUR MICRO WITH NO HIDDEN EXTRAS FOR AROUND £499.



The title of 'genius' is not bestowed lightly on man or machine: those extraordinary qualities and powers of intellect are rare.

Einstein had them in full measure. And so now does the new micro computer from Tatung, designed and built in Britain and appropriately named – Einstein.

Einstein was created by Tatung, one of the world's leading electronic companies, and given the capacity and the remarkable capabilities to compete with computers costing far more.

Its simplicity of operation will appeal to the first time buyer and to businessmen who don't want to lose staff to expensive and time-consuming training courses. At the same time its operating system is both powerful and sophisticated to satisfy the most advanced requirements.

For those who have outgrown their existing primitive machine, the speed and capacity of the 500K built-in disc drive will make all the difference. And for the small businessman, the ability to store and retrieve all information in seconds will be as important as Einstein's built-in flexibility, which allows the system to grow as the business develops.

BUILT-IN 80K MEMORY
Total memory capacity 80K RAM divided into 64K 'user' memory and 16K for colour graphics production.

BUILT-IN DISC DRIVE
500K 3" compact floppy disc drive. Potential for massive extra storage with a second 500K disc drive internally.

BUILT-IN 16 COLOUR GRAPHICS High resolution graphic animation from 32 sprites (definable shapes), 16 vivid colours.

BUILT-IN EXPANSION PORTS
Connection to both TV and optional colour monitor, most printers and other computers via RS232C interface. Also twin joystick ports, 8 bit user port, exclusive Tatung Pipe.

BUILT-IN FLEXIBILITY
Powerful Crystal BASIC. Multi-lingual plus ability to run CP/M.†

BUILT-IN VERSATILE SOUND
Sound synthesiser facility includes chromatic music with three voices. Substantial speaker with volume control. Provision for speech synthesiser.

Einstein has them all. Feature for feature, it meets the needs of the novice and the experienced operator, both at home and in the office.

Einstein, designed and built in Britain, is a complete colour micro computer with no hidden extras.

And for under £500 is sheer genius.

TATUNG
Einstein
SHEER GENIUS: AT WORK, AT HOME.

DIAL 100 AND ASK FOR FREEFONE EINSTEIN FOR YOUR NEAREST STOCKIST.

†CP/M is a trade mark of Digital Research Inc.

Rebalance this sh

The BBC Micro can now give an astonishing new account of itself.

Because with Acornsoft's new 16K ViewSheet ROM, it develops a head for figures which can save you a vast amount of arduous brainwork.

Imagine, for instance, that you had to make several adjustments to a balance sheet.

If you made those adjustments on ViewSheet, it would revise the balance automatically in a split second.

Or imagine that you had to add 15% VAT to every figure on a price list containing 500 items.

ViewSheet can add the tax to each and every one of those items simultaneously. And once again, in virtually a second.

As simple as pencil and paper.

ViewSheet is a computer-based spreadsheet, the figure processing version of a word processor.

With 255 columns in width and 255 rows in depth, it's also one of the largest spreadsheets on the market.

Originating the sheet is as easy as originating an ordinary worksheet with pencil and paper.

Because ViewSheet comes with an easy-to-follow reference card.

It enables even the most inexperienced users to feed all the data they need to use, and store on disc or cassette, into the BBC Micro.

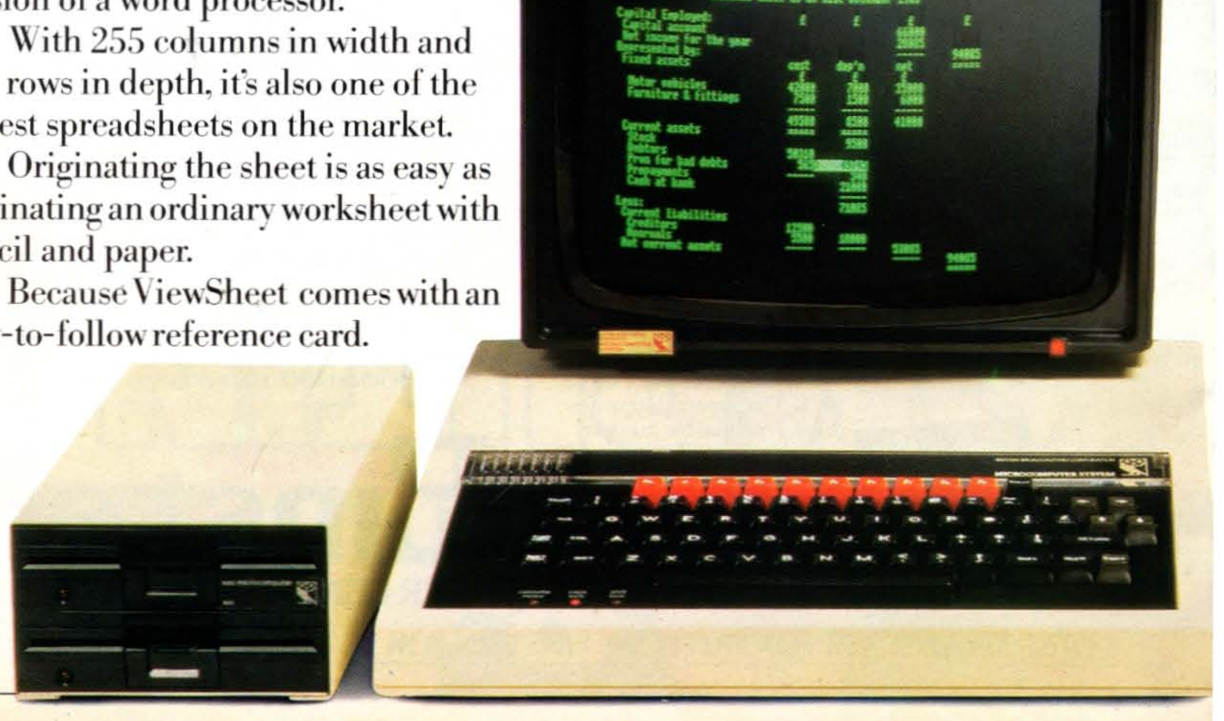
You can nominate headings and subheadings. And you can create barcharts to display figures graphically.

Ten windows for perfect vision.

The sheer size of ViewSheet makes it impossible for the whole sheet to be visible on the monitor at once.

That's why ViewSheet has ten windows, enabling you to see up to ten different sections of the sheet at any one time.

You can summon the windows onto



eet in one second.

the screen at the press of a key.

You can cross-reference sections, or even reposition them on the sheet, whenever you need to.

And you can print them out individually, as well as all together.

The possibilities are virtually endless.

By creating special disc files from ViewSheet, you can link two or more spreadsheets together. This means you can build models much bigger than the BBC Micro's considerable memory.

ViewSheet is also compatible with Acornsoft's View word-processing package. This enables you to produce reports and documents which combine text and figures.

In addition, you can use ViewSheet in any screen mode, making the most of the BBC Micro's potential. And if you use it with the 6502 second processor, you'll have no less than 30K of workspace in any mode.

For only £59.80,
you too can have figures like this.

The ViewSheet ROM can be fitted by your BBC Micro dealer in less than three minutes. And with its straightforward user guide, function key card and reference card, it'll soon have you juggling figures at lightning speed.

Indeed, at only £59.80, it's an invaluable asset for anyone involved in professional or personal finance, forecasts, formulae and analysis.

ACORNSOFT
VIEWSHEET
An electronic spreadsheet for the BBC Microcomputer

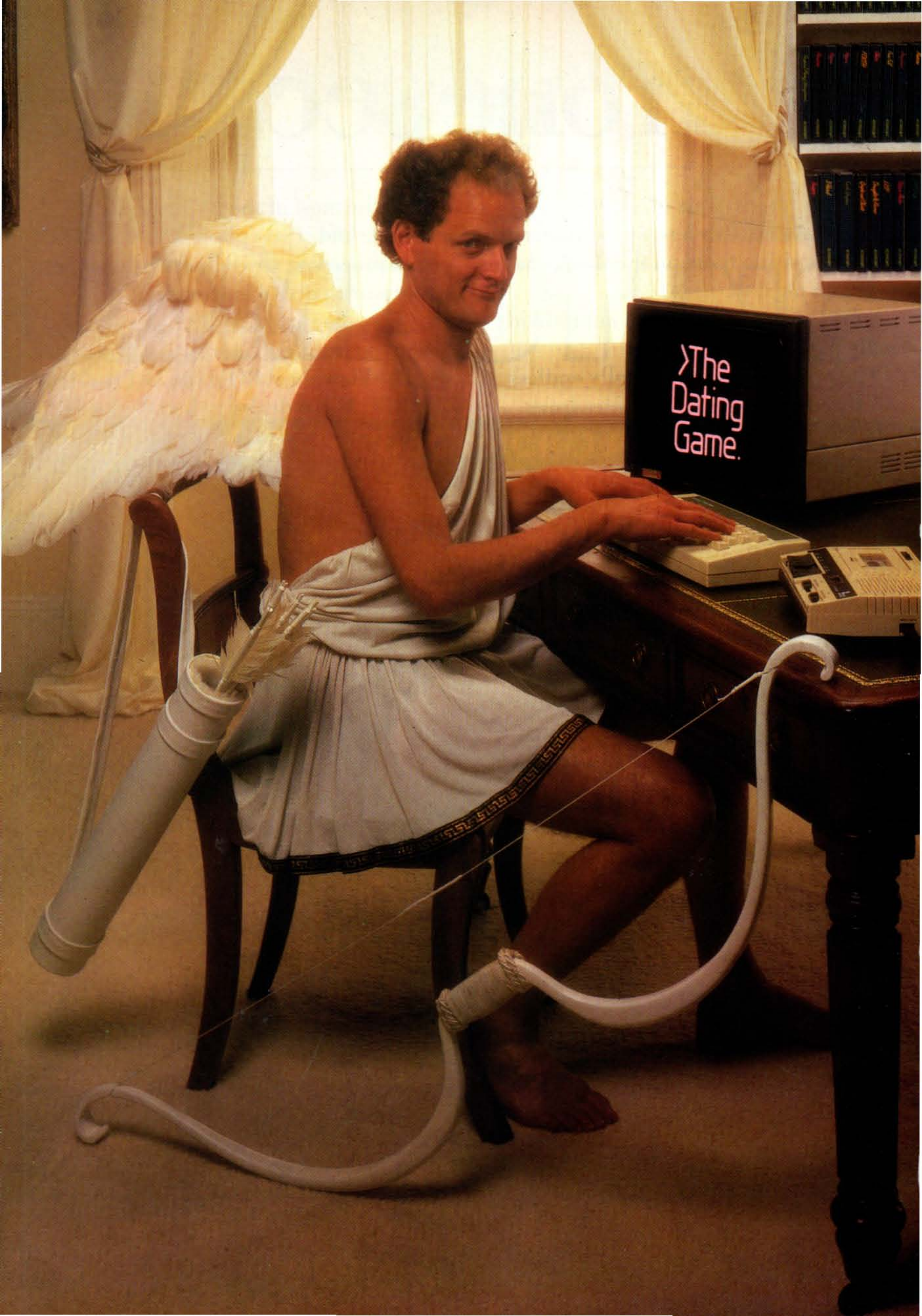
ViewSheet's operations and functions in brief.

The operations supported by ViewSheet are: addition, subtraction, multiplication, division, exponentation and bracketed operations.

And the functions supported are: ABS, ACS, ASN, SIN, SGN, RAD, ATN, COS, DEG, EXP, INT, LN, LOG, PI, SQR, TAN, MIN, AVERAGE, MAX, CHOOSE, LOOKUP, COL, IF, READ, ROW and WRITE.

ACORNSOFT

c/o Vector Marketing, Denington Estate, Wellingborough,
Northants NN8 2RL. Tel: 0933 79300.


>The
Dating
Game.

The Electron has added even more strings to its bow.

The list of top quality software for the Acorn Electron is growing all the time.

As you can see, there's already an outstanding selection of exciting programs covering everything from monsters to music and murder to marriage guidance.

And ultimately, the Electron will enjoy a range of software as comprehensive as that of its illustrious big brother, the much-acclaimed BBC Micro.

You'll find all the programs featured here at your local Acorn stockist. (To find out where that is, simply call 01-200 0200.)

Alternatively, you can send off for the Electron catalogue and order through the post by writing to Acornsoft, c/o Vector Marketing, Denington Estate, Wellingborough, Northants NN8 2RL. Tel: 0933 79300.

GRAPHICS: Graphs & Charts, Creative Graphics, Picture Maker.

BUSINESS: Personal Money Management, Desk Diary.

EDUCATION: Tree of Knowledge, Peeko-Computer, Business Games.

LANGUAGES: LISP, FORTH, S-Pascal, Turtle Graphics.

GAMES: Starship Command, Monsters, Chess, Draughts and Reversi, Snapper, Meteors, Hopper, Sphinx Adventure, Arcadians, Free Fall.

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CHILDREN'S EDUCATIONAL SOFTWARE: Happy Numbers, Timeman One, Timeman Two, Wordhang, Happy Letters, Map Rally.

ACORNSOFT

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SPECIAL OFFER

BBC Micro
(Model B)
New Low Price
£326

Price includes a **FREE** Data Recorder PLUS five software programs worth £80. (At Watford we give you a great deal for your money)

6502 2nd PROCESSOR	**£175**
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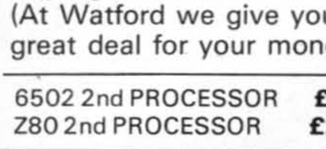
Dust Cover for BBC Micro
Protects your expensive Micro from foreign bodies. **£3.50**

SEIKOSHA GP100A PRINTER
10" Tractor Feed, 80 columns, 50CPS. Normal & Double width Char, Dot res graphics. Parallel Interface standard.
SPECIAL OFFER Only: **£144** £7 carr.)

FRICTION FEED
Attachment for GP100A or 250X Printers **£28**

GP-700 Colour Printer **Screen-dump** routine in **ROM FOR BBC** Micro **£12**

EPSON



RX80

100 CPS, 9 x 9 matrix, dot addressable graphics, condensed and double width printing. Normal, Italic and Elite Graphics. Tractor feed, 10" max width, bi-directional, logic seeking. Centronics Interface standard.

ONLY **£229** (£7 carr.)

EPSON RX80 F/T PRINTER
As above but has both Friction and Tractor Feed. £245.00 (£7 carr. Securicor)

PRINTER INTERFACE BUFFER
Neatly packaged self contained box, supplied complete with all leads, manual and detachable power supply.

Price: 16K Unit	**£115**
Price: 48K Unit	**£149**

Epson FX80 Printer
160 CPS, 11 x 9 matrix, proportional spacing, superscripts, subscripts, dot addressable graphics. Normal, Italic and Elite characters. Up to 256 user definable characters. Down loadable character set. Condensed and double width printing. Full proportional spacing. Four user defined margin positions. Tractor and Friction feed. 10" maximum width Bi-directional, logic seeking Centronics interface standard.

ONLY **£319** (£7 carr.)

Type	Ribbons	Dust Covers
MX80FT	£4.75	£4.50
MX100/FX100	£10.00	£5.25
FX80	£4.75	£4.95
RX80	£4.75	£4.50
GP80	£4.50	–
GP100	£4.95	£3.95
GP250	£5.95	£3.95
GP700	£18.50	
KAGA KP810	£5.95	
CANON PW1080	£5.95	

RX & FX PRINTER INTERFACES

RS232	£35	RS232 + 2K Buffer	£59
IEEE 488	£65	2K Parallel	£58

BROTHER HR-15
DAISY-WHEEL PRINTER

An exceptionally high quality daisy wheel printer at the price of a dot matrix printer. 18CPS; bi-directional, 3K of buffer; has clear buffer facility, carriage skip movement, proportional spacing; underlining; bold print and shadow print. Prints in two colours; super and subscript facility. Impact control facility to vary pressure on paper for making carbon copies. Has Centronics parallel or RS-232 interface. Connects directly to BBC Micro. A ribbon cassette plus a separate red ribbon. Optional extras: single sheet feeder takes up to 150 A4 sheets; a keyboard that transforms HR15 into a sophisticated electronics typewriter. Attractively finished in beige.

ONLY **£349**

Single Sheet Feeder	**£199**
Keyboard	**£150**

RIBBONS: Carbon **£3;** Fabric **£3;** Multistrike **£6**

LISTING PAPER (Plain)

1,000 Sheets 9½" Fanfold Paper	£7
2,000 Sheets 9½" Fanfold Paper	£13
1,000 Sheets 15" Fanfold Paper	£9
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PRINTER LABELS
(continuous stationery)

1,000 90 x 36mm	£5.50
1,000 90 x 49mm	£7.75
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BBC Micro WORD-PROCESSING PACKAGE
A complete word processing package consisting of: BBC Model B, Zenith 12" Green or Amber Monitor, Twin 200K highly reliable (1 year warranty) Cumana Disc Drives in matching beige colour, the popular WORDWISE word processor, Watford's own highly sophisticated 62 File DFS interface fitted, world renowned Brother HR 15 Daisy Wheel Printer, Gemini's BEEBCALC Spreadsheet Analysis, MAILING LIST and DATABASE Softwares on Disc. 10 blank 3M Discs (Lifetime warranty). A 4 way mains distribution socket.
10 blank diskettes, 500 sheets of fan-fold paper. Manuals and all the leads. To enable you to carry your Micro around, we shall pack it in our Antique Brown leatherette Attache carrying case.

ONLY **£1,199** (carr. £15)

(P.S. We will alter the package to suit your requirement. Call in for a demonstration).

KAGA KP810

This new JAPANESE printer has EPSON FX/RX compatible commands. 140 CPS Dot matrix Printer, offers **NEAR LETTER QUALITY** print in a 23 x 16 dot matrix in addition to the standard Epson style type-faces on the 11x 9 matrix. Friction feed, Adjustable tractor feed, Single sheet feed and built-in Paper Roll Holder. Normal, Italic, Enlarged, Condensed, Super and Subscript, Dot addressable graphics (8, 9 and 16 pin modes). Proportional spacing. (Optional extra: Down loadable character set in 8K ROM or RAM). NEAR LETTER QUALITY print, selectable at switch on. 10" maximum width, bi-directional, logic seeking. 3K Buffer. Half speed quiet mode. Convenient Paper-out sensor switch. Centronics Interface standard. All this plus our no quibble 12 months warranty.

Special Introductory Offer: ONLY **£249**
RS232 Interface + 2K Buffer **£89**

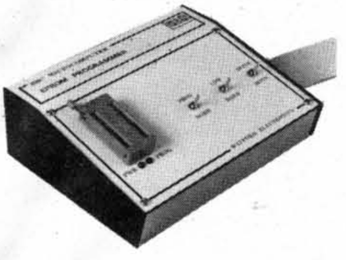
KAGA KP910 PRINTER
Similar features as the above KP810 printer but has extra wide carriage. Will accept upto 17" maximum width paper. 156 column normal and 265 column condensed.

ONLY: **£349**

PRINTER LEAD 36"
Ready made printer lead to interface BBC Micro to EPSON, SEIKOSHA, NEC, STAR, JUKI, BROTHER, SHINWA, CANNON, KAGA, or any Centronics Parallel Printer.

ONLY £7
Special Extra long 5 feet Cable **£10**

EPROM PROGRAMMER



At last! – the EPROM Programmer for BBC Micro Computer from WATFORD ELECTRONICS
that will suit both your pocket and all your requirements. Programs all popular types of EPROMS from 2K bytes up to 16K bytes – 2716 — 2516 — 2532 — 2564 — 2764 — 27128. Our Programmer has been designed to make sure the EPROMs are neither programmed too fast nor too slow; just at the right speed as recommended by the manufacturers of the EPROMs (any deviation in timings can burn their brains out).

This extremely powerful system is designed for your needs of TODAY & TOMORROW! – BBC Basic programs can be copied into EPROM and subsequently re-loaded faster than from a disc! Suitable for both hobbyist and professional users!

Just look at these features:

- **COMPLETELY SELF CONTAINED –** Housed in its own sturdy case – Uses its own power supply – connects directly to the 1MHz Bus – Simple and Safe!
- **FULL SOFTWARE SUPPORT** – Comes complete with simple to use fully machine code ROM based software and easy to understand manual. Facilities include Varification, Reading, Virgin Testing, Writing, Editing, Saving, Loading and more! NOTE!! – This software does not simply comprise hastily prepared routines to get you going, but is a professional, purpose designed applications package.
- **ACORN BUS COMPATIBLE** – Use of the 1MHz connection complies with all Acorn addressing recommendations – That means you can still add-on such things as the TELETEXT, IEEE 488 TUBE and PRESTEL
- Allows more than one program to reside in an EPROM using the ROM Filing System.

ONLY **£79** incl. Manual (£3 carr.)

TEX EPROM ERASERS

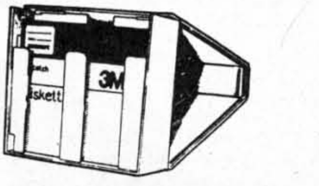
EPROMs need careful treatment to survive their expected lifetime. Rushing it could burn their brains out. So cop-out of this helter-skelter world; take it easy the TEX way and give your chips a well earned break. Cool, gentle and affordable. EPROMPT does it properly.

Two versions available:

- **EPROMPT EB** – The standard version. Erases up to 16 chips. **£28.00**
- **EPROMPT GT** – Erases up to 28 chips. Has an incorporated safety switch which automatically switches off the UV lamp when the Eraser is opened. **£30.00**

Spare 'UV' Lamp bulbs. **£9**

NEW DESIGN PLASTIC LIBRARY CASES



for Disc Storage 5¼" (holds 10) **£2**

MONITORS

- **MICROVITEC 1431**
14" Colour Monitor, RGB Input. (as used in BBC programmes) FREE Interface Lead. ONLY **£173**

MICROVITEC 1451 Hi-res 14" Monitor incl. lead	**£295**
MICROVITEC 1441 Super Hi-res 14" Colour Monitor	**£249**
KAGA 12" Standard resolution colour MONITOR/COMPOSITE VIDEO	**ONLY £195**
KAGA RGB 12" Medium Resolution Colour	**£195**
KAGA RGB 12" High Resolution Colour	**£259**
BNC Connecting Lead	**£3**
RGB Connecting Lead	**£5**
ZENITH 12" High resolution, jitter free picture, Amber or Green	**£75**

Carriage on Monitors £7 (Securicor)

5¼" DISKETTES

(Lifetime warranty)

Why settle for less, Buy the best.

10 SCOTCH 3M Diskettes S/S S/D	**£15**
10 SCOTCH 3M Diskettes S/S D/D	**£17**
10 SCOTCH 3M Diskettes D/S D/D	**£28**

DISC ALBUMS

Attractively finished in beige leatherlook vinyl. Stores, protects and displays 20 discs in double-sided clear view pockets. ONLY **£4.25**

LOCKABLE STORAGE UNITS

Attractively finished, strong beige plastic base fitted with dividers. Smoke acrylic top. Supplied with adhesive title strips for ease of filing.

M-35 Holds upton 35 mini discs	**£13**
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FLOPPY HEAD CLEANER KIT

Unless your Office/Home is dust free, you should clean floppy-heads at least once a week to avoid the risk of cross contamination. Very simple to use. Only **£14**

MONITOR CRT SCREEN CLEANING KIT

The anti-static spray controls dangerous static charges on the screen surface and ensures its optical clarity. **£12**

KEYBOARD CLEANING KIT

£16

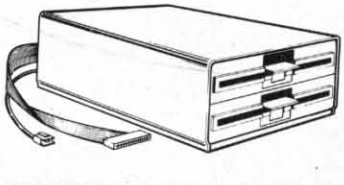
PRINTED CIRCUIT BOARD CLEANING & LUBRICATION KIT

£14

DISC DRIVES CASED WITH CABLES (less PSU)

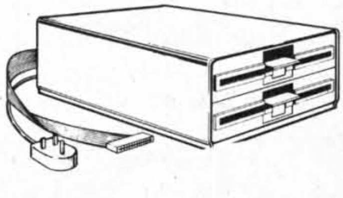
(All Drives are NEW SLIM-LINE Type)

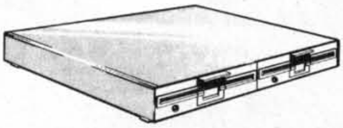
NEW LOW PRICES



CLS 100 Single, TEC Single sided 40 track 100K, 5¼" Disc Drive	**£115**
CLS400 Single, Mitsubishi Double sided 80 track 400K, 5¼" Disc Drive	**£165**
CLS400S Single, Mitsubishi Double sided 40/80 track Switchable, 400K, 5¼" Disc Drive	**£199**
CLD200 TEC Single sided 40 track 200K, twin 5¼" Drives	**£225**
CLD800 Mitsubishi Double sided 80 track 800K, 5¼" TWIN Drives	**£325**
CLD800S Mitsubishi Double sided 40/80 track switchable, 800K, Drives	**£249**

(CUMANA) DRIVES CASED WITH PSU & CABLES





CS100 TEC Single sided 40 track 100K 5¼" Single Disc Drive	**£139**
CS200 TEC Single sided 80 track 200K 5¼" Single Disc Drive	**£205**
CS400 Mitsubishi Double sided 80 track 400K 5¼" Single Drive	**£225**
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CD400 TEC Single sided 80 track 200K 5¼" TWIN Disc Drives	**£365**
CD800 Mitsubishi Double sided 80 track 800K 5¼" TWIN Drives	**£425**
CD800S Mitsubishi Double sided 40/80 track Switchable 800K TWIN Drives	**£465**

- SPARE DRIVE CABLES, SINGLE **£6;** DUAL **£8**
- DFS Manual (comprehensive) **£7.50** (No VAT)

P.S.
1. You do not require Formatting Discs when using our DFS as the formatting program is in the ROM, nor do you require expensive 40/80 track switchable drives as with our DFS you can read and write both 40 and 80 track discs in an 80 track drive (software switchable).

2. Our **MITSUBISHI** Slimline Disc Drives are Double Sided, Double Density, 1 Megabyte. Track density 96 TPI, track to track access time 3mSec. They are fast, efficient and highly reliable.

Continued →

MK 2 13 ROM SOCKET

EXPANSION BOARD

Now all lines fully buffered – On board battery back-up facility – will now accept EPROMS 2716, 2732, 2764 & 27128 and ROMs 6116 & 6264.

Simply plugs into one of the four ROM sockets currently available in BBC Micro. There are only 5 solder connections to be made. Full instructions are supplied. This board has been ergonomically designed to enable the user, easy further expansion inside the Micro, e.g. Double Density Board, Torch Board, etc. (At Watford, we think ahead.)

Our Mk2 13 ROM Socket Board enables the User to increase the sideways ROM capacity from the basic 4 sockets upto full 16 capable of being supported by current operating systems. In addition the board is designed with the facility to hold upto 16K RAM, which when switched into operation is automatically selected by any WRITE signal to the Sideways ROM area. This gives the User the ability to write a utility or language and upon pressing break have the utility or language up and running (new ROM software can be developed and tested in situ.)

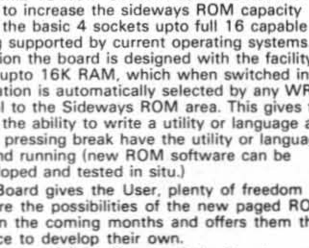
The Board gives the User, plenty of freedom to explore the possibilities of the new paged ROMs due in the coming months and offers them the chance to develop their own.

All lines are fully buffered and the Board meets or exceeds all timings for operation in the BBC Microcomputer. When fully populated, the ROM Board consumes less than half the recommended maximum current limit.

Supplied ready-built and tested complete with fitting instructions.

ONLY £32.50 (carr. £1)

Versatile **BEEB SPEECH SYNTHESISER** Unit



SIMPLY the best! – An unlimited speech synthesis system. Complete with easy-to-follow manual. Controlling software is in ROM so no Cassette Loading problems!

PHONEMES for word synthesis – That means unlimited vocabulary! No extra speech dictionary chips to buy!

BUILT-in Library of approximately 500 words to get you started.

ENGLISH accent – Utilises inflexion techniques to produce highly comprehensible speech.

EASY to use system – Just plug the software ROM into a socket, the Speech unit into the User Port, and away you go! No specialised 'dealer upgrade' required!

COMPACT unit – The whole system is built into a small case – easily tucked behind the computer. Auxillary output socket provided for direct connection to an external amplifier.

HOURS of fun! – Suitable for any application – Games, Educational Programs, Specialised Packages.

We know this all seems to good to be true but DON'T BE LEFT SPEECHLESS! Order your Versatile Speech Unit now!

Only £44

WATFORD'S LAUNCH OF THE YEAR APEX

The ultimate expansion system for the BBC microcomputer. It enables you to increase memory capacity to 2+/MEGABYTES including BATTERY BACKED-UP RAM.

The system consists of a mother board which fits inside the BBC and further daughter cards can be connected externally.

The internal card has the following features:

- 15 ROM/RAM sockets, 11 of which can be configured as 2716, 2732, 2764, 27128 EPROMS or ROM equivalent devices or as 6264 RAMs. Any RAM is Automatically battery backed-up and it's contents preserved when the power is turned off.
- The battery is recharged every time the machine is turned on and lasts several months, depending on the number of RAMs fitted.
- There is very little extra current drain, even with a fully loaded board as only the presently active ROM is powered up. In fact the fully populated board uses only 300/mA.
- The board reduces micro bus loading by up to three ROM loads, which improves reliability and performance.
- Installation is extremely simple. There is no soldering required. The board is rigidly held by two 40 pin sockets and five support posts.

A ribbon cable can be brought outside the computer and up to 8 external cards added. This enables the user to plug-in up to 142 paged ROMs. The cards have following features:

- Each card can accommodate up to 16 devices each of which can be configured as 2716, 2732, 2764, 27128 ROMs or 6264 8K RAMs.
- Battery backup is provided from the internal card.
- Only the active ROM is powered up permitting many external ROMs to be added with very little current loading (/100/mA per card/).

The system comes with controlling software in ROM. The utilities supplied are as follows:

- APEX – replies with the device number currently being accessed.
- APEX C – toggles between the colour and standard black and white messages.
- AL – loads from any device, regardless of the data type.
- AS – saves memory to any specified RAM device.
- AD – prints a directory of the devices present in the system, i.e. ROMs present and files stored. This also reports on the amount of free storage space.
- AF – asks for the free RAM devices.
- LA – repeats the last command to paged ROMs.
- AT – enters a memory testing routine. This will write a test pattern into the memory and read it back out again. If a fault is found, it is reported to the user. This test continues until Escape is pressed.
- RDISC – activates APEX as a filing system which then treats all free APEX RAM in the system as a continuous 'RAM-DISC'. All commands have similar format to the DFS and transfer is possible between the two systems.

The complete computer system bus is available to the user, so that other cards/devices could be added such as EPROM programmers, second processors, Winchester disc drives, clocks, etc. By racking the cards you eliminate the tangled mass of cables that usually accumulates around the micro.

A comprehensive operating manual is supplied with every APEX Board. Please write in for further details and prices.

BEEBFONT ROM

BEEBFONT is a remarkable new concept in BBC software, exclusively available from Watford. Once fitted, the 16K ROM will enable you to produce attractive text displays in following different styles:

★ **It works in modes 0, 1, 2, 4, using full colour.**

★ Simply use Ctrl–V to select the font and all further screen output will be in a new style.

★ Even the ordinary Beeb character set can be enhanced by doubling height or width and emphasising to give bold print.

★ A comprehensive editor is included which enables the user to design his own characters.

★ A spooling program is provided, which enables pre-formatted text files to be displayed on an EPSON FX, RX, and NEC Printers, using the full range of character styles. (Please specify printer type when ordering). Can be used with WORDWISE.

★ This really must be one of the most original and exciting products of the year.

★ A twenty page manual is provided and the demo/editor software comes on disc or cassette (please specify when ordering). **ONLY £39**

THE ULTIMATE DFS FOR BBC MICRO

by

Watford Electronics

Highly acclaimed at The ACORN and BBC MICRO USER Shows. What do the independent press say?

Good value for money – *Beebug Aug. '83*

A very worthwhile package – *The Micro User*

You'll be buying a very powerful package – *Personal Computer News*

Superior DFS; Excellent disc sector editor – *Computer Answers*

Without a doubt, the most sophisticated DFS Software yet written for BBC Micro Computer. This powerful new DFS is fully compatible with ACORN DFS yet has much increased power due to additions, carefully designed to make life easier in normal use. It consists of over 14K of efficiently written machine code. It is entirely self contained and so does not require a utilities disc to function.

Please write in for full technical specification.

PRICES:

DFS (Disc Filing System) ROM **£29**

Complete Disc Interface Kit including

DFS ROM & Fitting instructions £99

Disc Filing System Manual. Comprehensive and clearly written £7.50 (no VAT)

P.S. We will exchange your existing ACORN DFS or PACE (AMCOM) DFS for Watford's highly sophisticated 16K DFS ROM for **£25**

Watford's DFS is exclusively available from Watford Electronics. We do NOT retail through any dealers. Every ROM carries a label with our LOGO and a serial number.

Now available:

Acorn DFS Kit **£95**

EPROMs & CMOS RAMs

2764-250nS (8K ROM)	**£5.95**
27128-250nS (16K ROM)	**£24.00**
6116-150nS (2K RAM Low Power)	**£5.75**
6264-150nS (8K RAM Low Power)	**£28**

WATFORD'S BEEB PRINTER ROM

"Makes Printing Childs Play"

Are you fed up with not being able to unravel your printer manual and use all those features you paid for? Need sensible paging for use in the creation of booklets? Then you certainly need our Beeb Printer ROM.

A machine code printer utility in ROM.

- 'Single' key operations replace control code sequences for underline, font and size selection, paper movement, etc. Up to 30 come pre-defined, without effecting normal fn key usage.
- **This rom allows easy control of your printer from 'Within' WORDWISE text. Instead of long escape sequences, you just 'OC' a single number to Select, Underline, Print Styles, etc.**
- Automatic fanfold page margins. Puts gaps in listings. PRINTed text etc to skip the folds. The gap size alternates to minimise paper wastage when using binders.
- Form feed and related commands, made available on ALL printers. Can also provide a left margin.
- User defined characters embedded within text are printed as on VDU.
- ★Commands select option for GP100, STAR, NEC, MX/FX, LP VII/DMP100, DMP200. Operates with Parallel and Serial Printers.
- Fully functional with the popular WORDWISE wordprocessor.

Supplied complete with a comprehensive 50 page manual.

Price: £24

(When ordering, please specify printer type)

DUMPOUT 3

A highly sophisticated machine code ROM providing screen to printer dumps in any mode, plus window setting utilities and two new OSWORD calls that allow you to use the Beeb graphic coordinate system for plotting or testing mode 7 'pixels'.

*GIMAGE Ultra sophisticated dump of any graphic screen, using up to 8 tones. Handles **FULL MODE 7 text,** graphics, double-height and colour and mode 8. 14 optional parameters, using 'prefixing' so that you only need specify the ones that you want. The parameters include:

- V<scale>, H<scale>. These are both 2 byte numbers giving you very fine control over the dump size from minute to enormous. Unlike other dump Roms, scale does not vary with screen mode.
- R <0-3> Dump rotation 0, 90, 180, 270 degrees.
- I<indent> Set gap from left edge of paper.
- X <min> <max>, Y <min> <max>. The area of the screen dumped is that in the graphics window, alternatively these parameters may be given.
- P Physical colour values used for dumping. (Otherwise use a negative scale, i.e. white prints darkest.)
- T Two tone dumps for higher resolution.
- M <mask> 8 bits controlling colour masking.
- E Contrast expansion. Makes mode 7 text characters and separated graphics stand out more clearly from the background.
- C All mode 7 graphics printed as reduced size dumps.
- *GWINDOW Draws graphic window on screen, its size and position can then be altered using the cursor keys.
- *TIMAGE <indent> Does a fast, text only dump of the text window in any mode.
- *TWINDOW As GWINDOW but for text.

DUMP OUT 3 gives you ALL of the GIMAGE facilities listed above and GWINDOW in mode 7 as well, not just hi-res modes.

Ideal for CP80, GP80, DP100, GP250, STAR, KAGA/TAXAN, NEC, SHINWA, CP80, GEMINI, EPSON MX/RX/FX, LPVII, DMP100/120/200/400 Printers.

Comprehensive Manual included. Only **£22**

APPROVED for use
with telecommunication systems
run by British Telecommunications
in accordance with the conditions
in the instructions for use.

Watford Electronics

MODEM 84

For BBC Microcomputer

With the launch of Watford's MODEM 84 you can now hook into PRESTEL, MICRONET, HOMELINK, TELECOM GOLD, etc., for about the cost of a good tape recorder. Prestel gives you access to an incomparable database covering almost every subject under the Sun. There is Micronet with lots of free programs that you can download and run. Details of Clubs and User groups, a diary of meetings and exhibitions, news and reviews, technical information, etc. There is Homelink with On-line banking. And there is armchair shopping, travel information, Entertainment, World News, Sports News, Business News, Weather information, Electronic mail and lots more. The basic Prestel subscription is only £5 per quarter for domestic user and at off-peak times there is no charge for access time. Can you afford not to be part of this revolution?

Now using the latest techniques and the new generation of Modem chips, Watford have developed a Modem that is newer, better and yet cheaper than any on the market.

Compare the Specifications:

MODEM

- Direct-connect Modem using BT approved isolation components.
- Full Duplex V23 operation for Prestel and TELECOM GOLD operation (1200/75 Baud).
- User-to-User half duplex 1200/1200 Baud operation with AUTOMATIC SEND/RECEIVE switch (BEWARE – most MODEMS switch manually between send and receive, which precludes the use of intelligent user-to-user software).
- Simple single button operation and comprehensive LED status display.
- Attractively finished. Sized to sit on the Disc drive.

FX80 PRINTER DRIVER for VIEW

Do you want to use Italics or Enlarged Characters with View? French or German Characters? These and other FONTS from FX80 character sets can be accessed using our Printer Driver with VIEW. The disc contains an example as well shows how to use. Available on 40 or 80 track Disc. **ONLY: £9**

EPSON DUMP ROM

A specially designed Dump ROM for EPSON RX, FX and the new Kaga KP810 Printers. Will accurately DUMP all Screen modes including TELETEXT, GRAPHICS and DOUBLE HEIGHT. MULTITONE DUMPS are also supported. Simple single command (*SCDUMP) operation.

Only: £20

COMMUNICATION
WATFORD ELECTRONICS GIVES YOU
'THE KEY TO WORLD COMMUNICATION'

NEW SUPER PRESTEL INTERFACE ROM

Fully compatible with Watford's MODEM 84 as well as with PRISM and most other Modems.

- Supports full Prestel Colour Alpha and Graphic Characters including Double Height, Flashing, Conceal/Reveal.
- Called by simple *PRESTEL command. Disc and Tape configurations fully supported.
- Telesoftware downloader included.
- Comprehensive MAILBOX facilities including offline editor.
- Auto Logon sequence, can be burnt into ROM if desired.
- Unique "TAG" facility allows tagging and recall of interesting pages – avoids the common and annoying 'NOW WHERE WAS THAT PAGE' problem.
- Page load and save to tape or disc. Pages are automatically saved under Page Number reference in a 'FRAME' directory.
- Print page options are ASCII only (i.e. with supression of Graphics) – fast and works with any printer – as well as a full graphics dump for the popular Epson printer.
- 'USER' function call built into interface with specialist add-on routines (your own as well as ours).
- All the above facilities available from Function Keys. An overlay is provided giving simple yet comprehensive guidance to the key functions.
- Comprehensive instruction manual supplied.

PRICES:

SOFTWARE ROM incl. Comprehensive Manual	**£20**
MODEM 84 (without software)	**£62**
MODEM 84, SOFTWARE ROM and Operating Manuals	**ONLY: £82** (£2 carr.)

(Please allow upto 28 days for delivery)

Please write to Watford Electronics for full details, Order and Application Forms.

TINY PASCAL for BBC Micro **£59**

VIEW

Wordprocessor (New version) **£49**

FORTH ROM for BBC

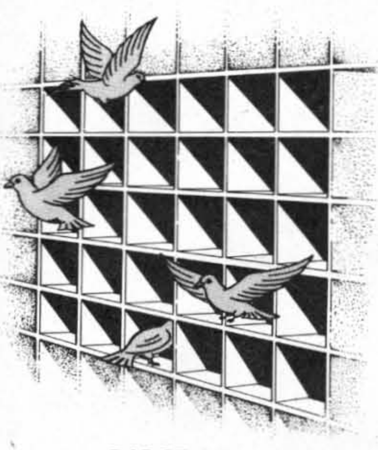
This superb (FIG FORTH) compiling language now available in ROM. Simply plugs into one of the ROM Sockets. Manual included. **£33**

WATFORD ELECTRONICS

Continued →

WONDERFUL WATFORD

TWO DATABASE SOFTWARE for BBC MICRO



DISCDATA

At last for BBC Micro Disc users, Watford Electronics have produced 'DISCDATA' which must be the most versatile general database at the price on the market. The length of your files is restricted only by the space on your disc. You can have upto 20 fields with 'page' length records of upto 254 characters. The program is completely menu driven obviating reference to a manual although written guidance is given with the program. Add and delete records, amend title, field names and records, sort on any field and search for any record or group of records in any field. You do not need to abandon or rewrite your files if you wish to add additional fields or extend the length of any field, the program will rewrite the files for you. Your files can be in any drive. Output can be in 40, 80 or 132 character width with Printer routines. Two forms of output are provided for horizontal for label type output and a tabulated output with title and headings. What is more, the selected fields can be placed in any order on the screen. In the horizontal mode you can scan backwards or forwards with wrap around effect. Output can be started or stopped anywhere in the file. There is automatic totalling on decimal fields and an automatic count of the number of records output.
Now with extra 3 features: Allows string search; Calculations can be done on numeric fields; Create Sub-Files from the main File.

On disc at **Only £17**

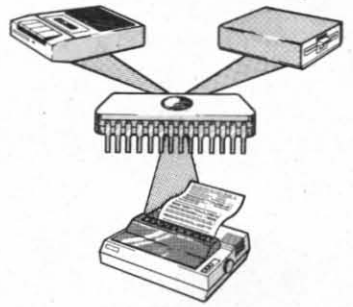
It has to be the best value.

FILE-PLUS

Now even more powerful with the added facility of a SHELL SORT on any field. This must make DATA-PLUS the most powerful and versatile Database to be found on BBC Micro.
A 16K ROM containing the most flexible and easy to use disk based Database system on the market. A database may occupy your total on-line storage capacity. You may design any number of data entry forms using a "paint" on screen technique. Forms may be upto 3 screens in size. A form may be used to Add, Delete, Update, Print and Spool records from your Database. Quick search facility on any text field. A query language provides full maths support (–, +, /, *, +–9999999999.9999) and compare facilities (=, >, <>, <=, >=, &, !) when used with the keywords – Assign, Compare, Display, End, Goto, Iff, Ift, Print, Read, Search, Spool and Update. Full printed output control via embeded commands. Supplied with 70 page manual and fitting instructions.

Only £43

BUFFER & BACKUP ROM



A very versatile firmware. An ideal ROM for engineers, programmers, teachers, students, etc.

★ Converts your Sideways RAM to a 4K or 16K BUFFER for a parallel printer. (Uses * FX5,3). (You no longer require to purchase expensive (£100+) Printer Buffers.)

★ Dumps selection of Disc files to Tape.

★ Makes backup copies of tapes onto Tape, Disc and Hobbit.

★ Displays contents of a chosen paged ROM on screen.

★ Menu display on 'shift-break' using ROM Filing System.

★ Comprehensive Manual

Simply a give away at **£22**

GEMINI'S BUSINESS SOFTWARE

Cashbook Accounts	£52
Final Accounts	£52
Invoices & Statements	£17.25
Commercial Accounts	£17.25
Mailing List	£17.25
Database	£17.25
Stock Control	£17.25
Home Accounts	£17.25
Beebcalc Spreadsheet Analysis	£17.25
Beebplot	£17.25
Payroll	£39

N.B. All the above Gemini software is on tape. For Disc Based (40/80 track) please add £3.

PEN PAL – VERSATILE LIGHT PEN SOFTWARE

- Enjoy, Explore, Educate!
- Pixil, Line, Character Definition
- Free hand drawing
- All Colours – MANY Special Effects
- Fill, Refill and Stripes
- User defined "Brushed Strokes" plus Character definer
- Grid, Scale, Perspective aids
- 2 TO 200 Points palletable in one Design with Circles and "RUBBER BANDING"
- Move design/character to any screen position
- Save and Load screens, User defined Graphics and line drawings for video titles, Own programmes, etc.
- Many Educational uses
- Instruction booklet included
- Full software support for "CUSTOM USE"
- Works with Watford, RH, Acorn User, DIY, and many other LIGHT PENS
- Available on DISC or TAPE

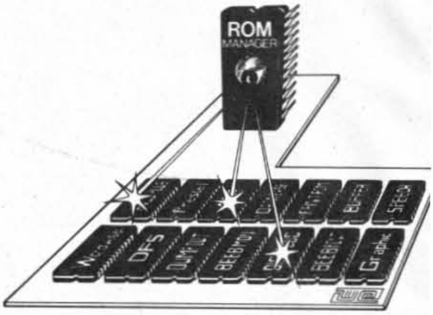
Price: Tape **£10;** Disc **£11**

DISC EXECUTOR

Disc Executor (our most popular software) is a highly sophisticated disc utility, which allows you to transfer all tape based software that we know of onto disc. You no longer have to throw away any of your cassette based software on acquiring a disc drive. It handles 'locked' programs and allows you to load full length adventure type programs (i.e. up to & 6E blocks) and programs that load below &E00. It is very simple to operate (full instructions supplied). It saves you your valuable time and money too. Our Disc executor is not a Replica, its the 'Real Thing'.
Available in both 40 and 80 track discs. Please specify when ordering.

Only: **£10**

ROM MANAGER



This unique piece of firmware has been designed to allow the USER to access the BBC Micro's Sideways Rom Paging facility to the full. The 18 Commands our ROM MANAGER adds to your computer are concerned with 3 aspects of ROM use:

1. ROM CONTROL – Ability to activate at random any of the ROMs present in the Micro.
2. BBC MICRO's STATUS – e.g. Checksum on any ROM, and the Filing system currently active.
3. ROM DEVELOPMENT – Allows main memory to be used like Sideways RAM.
The Commands available are:
***CHECKSUM** – generates a CRC for the specified ROM.
***DIRECT** – allows you to pass a particular command to the specified ROM.
***EXAMINE** – allows examination of the named ROM.
***EXPLAIN** – gives detailed description of the first 22 FX codes.
***FILE** – passes the command directly to the currently selected filing system.
***FUNCTION** – displays the string currently programmed onto the function keys.
***INCLUDE** – allows he main memory to be used for developing ROM software without need to purchase expensive sideways RAM.
***MODIFY** – any location in memory is displayed and can be modified with this command.
***NAMES** – displays the names of any resident ROMs.
***RAM** – allows the command to be passed directly to the 'RAM based ROM'.
***REMOVE** – turns off the 'RAM based ROM' option.
***SPECIFY and *DEFAULT** – specifies the default ROM and passes the named command to the default ROM specified.
***STOP and *START** – allows the named ROM to be disabled or enabled, preventing clashes between ROMs.
***STATUS** – provides information about the ROMs inside the BBC micro, including the socket number, the name of the ROM, its length, whether or not it is enabled and supports language or service entry points.
***VALUES** – outputs information concerning the status of ROM MANAGER e.g. the socket number it occupies, the number of active ROMs with a higher priority than itself, the current filing system.
***VECTOR** – the same function as *DIRECT, but provided in case *DIRECT clashes with other ROMs.
In our opinion this ROM is one of the most useful utility ROMs available on the market, and is a must for anyone using ROM based software.

Price: **Only £21**

ADE

The complete program development package on 16K ROM. A must for all the Assembly Language Programmers.

SPECIAL OFFER **£49**

ACCESS HOT LINE

Tel: 0923 50234

Watford's own Machine code Monitor ROM written by Andrew Bray (Cambridge), co-author of the BBC Micro Advance User Guide.

The most powerful and versatile machine code monitor ROM yet written for BBC Micro. It has all the normal memory editing, moving and relocating facilities, plus all editing is with a full screen editor allowing scrolling up and down memory, entering in Hex, ASCII or standard assembler mnemonics.
In use as a debugging tool, you run code under a total emulation system. Everfelt a desperate urge to set a break point in ROM? No problem – you can even have breakpoint on reading or writing locations in memory and on register contents. The system fully supports debugging of sideways ROMs e.g. BASIC can fully and easily be run from within Beebmon and from there DFS and other sideways ROMs can be used in total emulation mode.
Beebmon can even run itself. In so doing you can nest Beebmon up to a level limited only by the memory size. Beebmon uses 256 bytes of workspace, located anywhere in memory, even on the 1MHz Bus. Beebmon effectively uses no zero page workspace, so your program (e.g. BASIC) can use any or all of the base page. How does it achieve this? By providing a 6502 interpreter all programs running under it exist in a vertual BBC, so special memory locations like the ROM latch are not actually accessed by your programs, instead they alter a location in Beebmon's workspace. Emulation also allows immediate return to Beebmon command level by ctrl-escape no matter what code is being excuted at the time. All this exceptional power and flexibility is complemented by a clear and detailed manual included in a value for money price of:

£22

Disassembler Rom

```
D350 18          .   CLC
D351 A5 D6       ..  LDA D6
D353 6D 52 03 mR.    ADC 0352
D356 85 D6       ..  STA D6
D358 A5 D7       ..  LDA D7
D35A 6D 53 03 mS.    ADC 0353
D35D 10 04       ..  BPL D363
D35F 38          8   SEC
D367 6C 5D 03 l].    JMP (035D)
D36A 46 D1       F.  LSR D1
```

Discover the hidden secrets of BASIC and the OPERATING SYSTEM with this easy to use programmers tool.
A ROM based machine code Disassembler for the BBC micro. It enables machine code programs to be listed in BASIC/DUMP format and thus is the perfect complement to the built in assembler. It allows Sideways ROMs, files on disk or tape to be listed, and also has a comprehensive editor, allowing mnemonics to be altered directly, as well as HEX, DECIMAL, ASCII and BINARY memory editing. There is also a full set of labelling facilities available (up to 3,200 labels), with the major locations and routines already labelled.
Thus DIS-ASM enables any monitor program, such as BEEBMON to be used to much greater effect as it is not necessary to disassemble memory each time the display is altered.

ONLY **£18**

WATFORD – Always a step ahead

COMPUTER CONCEPT'S ROMS

CARETAKER Basic Utility	£28
Graphics ROM	£28
Disc Doctor ROM	£28

Wordwise

Without doubt a very sophisticated piece of software for the BBC Micro. It has all the features of a professional word processor yet is easy to use.

SPECIAL OFFER THIS MONTH: **£32**

THE INVESTIGATOR

Now you can make up back-up copies of all your Discs. Put the precious originals away in the safe and use your duplicates.
See what your 8271 can do! With Watford's Investigator you can find out about track formatting, sector length, etc. Investigate your disc and then make up your back-up copy.
Disc based software includes a comprehensive manual.

Price: **£15**

(Please specify 40 or 80 track when ordering)

LIGHT PEN for BBC Micro

This versatile lightpen is very easy to use. It allows you free hand drawing in all colours. Has Special effects facility and many educational uses. An ideal and easy way of communicating with Micros for Children.

Only: **£20**

(Price includes our highly sophisticated PENPAL Lightpen software on Cassette. Please add £2 for software on Disc)

GAMES SOFTWARE

ADVENTURE QUEST (L.9)	£8.50
COLOSSAL ADVENTURE (L.9)	£8.65
CHESS	£6.95
CHUCKIE EGG	£7.90
CRAWLER (WESOFT)	£5.00
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Escape from MOONBASE ALPHA	£6.95
FELIX in the FACTORY	£6.95
GALACTIC COMMANDER	£6.95
KILLER GORILLA	£6.95
MUNCHYMAN	£5.95
MOONRAIDER	£6.95
MUSIC SYNTHESISER	£8.25
PENGO (Watford)	£6.95
SNOWBALL (L.9)	£8.50
SWOOP	£6.95
Twin Kingdom Valley	£8.25
747 FLIGHT SIMULATOR	£7.75

NEW LAUNCH

Waford Electronics' 32K RAM EXPANSION BOARD FOR THE BBC MICROCOMPUTER

Now Watford Electronics brings you the latest state-of-the-art memory expansion board for your BBC microcomputer. This compact board which fits inside the computer does not just give you 16K or even 20K of extra RAM, but a massive **32K!!!**

There are many useful facilities available with this board:

- The top 20K of the expansion RAM can be used as the screen display memory, leaving all the standard BBC RAM free for programs or data storage. This allows good graphics and long programs to be combined. For instance you could have MODE 0/1/2 GRAPHICS AND 28K OF PROGRAM SPACE. The extra memory can be used by virtually any language or utility such as BASIC, VIEW, WORDWISE, etc.
- The full 32K or the bottom 12K of the expansion RAM can be used as a buffer for the printer, sound channels, RS423, keyboard or speech synthesiser. This allows very long text files to be printed while you are using 27K of program and 20K of graphics!
- This board is the ideal complement to any word processing system. There is no need to wait for slow printers as you can type in long text in 80 column display mode while printing is going on – TWO JOBS DONE SIMULTANEOUSLY!!! (an equivalent printer buffer would cost you £115+).
- The board is compatible with a vast range of software and hardware available for the BBC microcomputer, including our ROM expansion board and double density DFS.
- The board is extremely easy to fit. It is supplied complete with a comprehensive manual and ROM based software with full *HELP messages.

SPECIAL INTRODUCTORY OFFER

Only: £79 (carr. £1)

GRAPH PAD

With this popular British Micro's Graph-pad, you can add new dimension to your computer enjoyment. It helps you to create your own application programs by the simple use of the Graphpad. Ideal for Educational use. Supplied complete with Cables, Manual and a two program cassette.

Price: **£115**

SURGE PROTECTOR Plug

Safely eliminates dangerous voltage surges. During a thunderstorm, a nearby lightning strike can induce high voltage spikes in the voltage supply or fluctuating loads can also result in transient overvoltages which if unchecked, lead to expensive data corruption/loss. Our surge protection plug will provide the necessary surge protection. Simply replace your standard 13Amp mains plug with the surge protection plug (which is almost the same size). Ideal for computers, Hi-Fi systems, precision instruments, fridge freezers, etc. Max. surge current 2KAmp; Max. Voltage 250 Volts. A must for all serious computer users.

Price: **£8.95**

WATFORD ELECTRONICS

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BOOKS (No VAT on Books)

30 Programs – BBC Micro	£3.25
30 Hour BASIC (BBC Micro)	£6.95
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6502 Assembly Language Subroutines	£14.25
6502 Machine Code for Beginners	£5.95
6502 Software Design	£10.50
A young persons guide to BBC Basic	£4.50
Advanced Machine Code Technique for BBC	£7.95
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Advanced 6502 Interfacing	£10.95
Advanced 6502 Programming	£12.45
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BBC Basic	£7.95
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BBC Micro An Expert Guide	£6.95
BBC Micro Book BASIC Sound & Graphics	£7.95
BBC Micro Graphics and Sound	£6.95
BBC Micro Programs in Basic	£5.95
BBC Micro **ROM PAGING** System Explained	£2.50
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FORTH Programming	£14.40
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Using 6502 Ass. Language	£14.50
Wordstar & CP/M made easy	£6.95

DOUBLE DENSITY BOARD

We are proud to announce the launch of our Double Density Board for the BBC Micro. The DDFS software that we supply is a version of our highly acclaimed standard 16K DFS for the BBC Micro. It has all the features of the single density DFS. Allows single files upto 359K. It will automatically tell whether a single or double density disc is being accessed, as well as allowing the option of reading 40 track disc on an 80 track drive. Now on your 80 track Double Sided Drive you will have 720K storage instead of the usual 400K and with higher speed than ever before (of course this is a BONUS at NO EXTRA COST).
Complete Double Density Upgrade Unit will cost same as single density Kit.

Delivery 4 weeks (approx)

DATA RECORDER & ACCESSORIES

Top quality Slimline, portable Data Recorder for computer use. Mains/Battery, operated with counter **£22.00**

DATA RECORDER CABLE
For our Data Recorder to BBC Micro **£2.50**

DATA CASSETTES Top grade C12 Data Cassettes in library cases. **36p**

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These Attache Carrying cases are attractively finished in mottled antique brown leatherette. An ideal and very safe way to carry your BBC Microcomputer. Price: **£12** (£2 carr.)

This space reserved for our 'Launch of the Year' Hardware

This space reserved for yet another launch of our Hardware for the BBC Microcomputer. – to be unveiled at the Acorn User Show OLYMPIA - LONDON. August 1984.

VOLTMACE'S DELTA 14 Hand-set

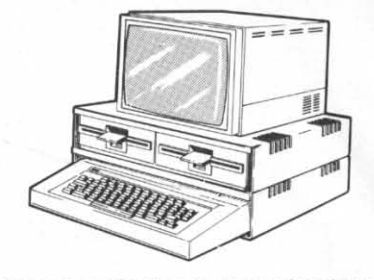
Price: 'Delta 14' Hand set **£12.50**
ADAPTOR MODULE **£12.55**
TRANSFER PROGRAM Tape **£5.10** Disc **£7.95**

JOYSTICKS for BEEB

Two versions available:

SINGLE: Player type **£7.00** each
TWO Players type **£12.00** per pair

PLINTH FOR BBC MICRO



Protect your micro from the weight of the heavy TV/Monitor. This sturdy plinth is attractively finished in BBC colour. Air vent slots have been provided to allow maximum air circulation. It can be used to support a monitor or a printer. The micro slides underneath comfortably. A must for every BBC Micro owner, specially for those who have to move/open their computer frequently.

Single Decker **£11** (carr. £1.50)
Double Decker **£20** (carr. £2.00)

PLINTH FOR PRINTERS

Keeps your desk tidy. Place the printer on the plinth and the paper underneath. Finished in BBC colour.

£10 (carr. £1.50)

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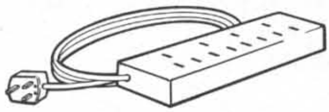

A highly versatile space saving solution when multi-power outlets are required. Can be wall or floor mounted. Ideal for Micro Computer and peripherals application. Prevents you getting a dangerous tangle of plugs and adapters.

Only: **£9.50**

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Monitor Lead, BNC to PHONO	**£3.00**

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Single: **£3.00** Dual **£3.75**

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	Plugs	**Sockets**
RGB (6 PIN DIN)	**30p**	**45p**
RS423 (5 pin Domino)	**40p**	**50p**
Cassette (7 pin DIN)	**25p**	**65p**
ECONET (5 pin DIN)	**20p**	**30p**
Paddles)15 pin 'D')	**110p**	**215p**
BBC Power Plug 6 way	**80p**	–
Disc Drive Plug 4 way	**75p**	–

Prices subject to change without notice and availability.

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"There is no doubt that the JVC range of ECM colour monitors is excellent value for money . . . there is no loss in quality of picture after long periods . . . and remember, as more and more resolution is available with new micros, the need for a better display will be that much greater."

High recommendation indeed from Personal Computer News. Meanwhile Acorn User said:

"It seems that all 'normal' and 'medium' resolution monitors, including the Sanyo, are simply inadequate to deal with the Beeb's graphics and text output . . . The JVC was excellent, giving clear, legible results . . . Was the JVC better than the Microvitec?* Would I buy one? Yes to both questions."

Our RGB high resolution colour monitor (580 × 470 pixels) sells for £229.95 (excluding VAT) – that's a saving of over £100 compared with other leading monitors of similar specifications.

The unit has a 14" screen and is suitable for the BBC Micro, Electron, Sinclair QL, Lynx, Oric, Apple, IBM and most other leading micros.

MODEL REFERENCE	1302-2 High Resolution
RESOLUTION	580×470 Pixels
C.R.T.	14"
SUPPLY	220/240v. 50/60Hz.
E.H.T.	Minimum 19.5kv Maximum 22.5kv
VIDEO BAND WIDTH	10MHz.
DISPLAY	80 characters by 25 lines
SLOT PITCH	0.41mm
INPUT: VIDEO	R.G.B. Analogue/TTL Input
SYNC	Separate Sync on R.G.B. Positive or Negative
EXTERNAL CONTROLS	On/off switch and brightness control

And naturally there's a year's full guarantee.

If you order your monitor by post, you'll receive it within ten days by courier service.

Simply post the coupon below to: Opus Supplies Ltd., 158 Camberwell Road, London SE5 0EE. Or telephone 01-701 8668 quoting your credit card number. Or, of course, you can buy at our showroom between 9.00–6.00pm, Monday–Friday. 9.00–1.30pm, Saturday.

*Microvitec Cub 14" monitor.

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______ High Resolution Colour Monitor(s) at £229.95 each (ex. VAT).
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I understand carriage per monitor will cost an extra £7.00. (N.B. A High Resolution Monitor including VAT, lead, and carriage costs £279.39. A Medium Resolution Monitor including VAT, lead and carriage costs £221.89).

I enclose a cheque for £______ Or please debit my credit card account with the amount of £______ My Access/Barclaycard (please tick) no. is______
Please state the make of your computer______
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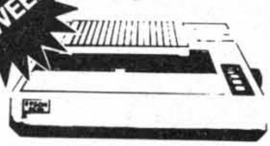

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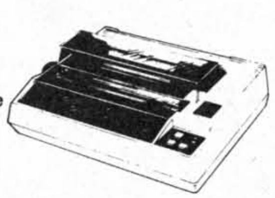

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Part 17 of MIKE BIBBY's introduction to programming

Accuracy, memory or speed?

HAVE a look at Program I – you should see that it's nearly identical to last month's Program IV with one important alteration – all the variables are real variables rather than integer variables. That is, I've left off the % signs.

```
   10 REM *** PROGRAM I ***
   20 MODE 6
   30 VDU 14
   40 INPUT "Maximum Number", max
   50 DIM square(max),cube(max)
   60 FOR loop = 0 TO max
   70 square(loop)=loop*loop
   80 cube(loop)=loop*loop*loop
   90 NEXT loop
  100 FOR loop=0 TO max
  110 PRINT loop,
square(loop),cube(loop)
  120 NEXT loop
  130 VDU 15
```

If you saved Program IV, as I suggested last month, all you have to do is some nifty work with the copy key.

However, the change from integer to real means a lot more to the micro than just a missing character. You see, the micro remembers, or stores, real variables in a different way to integer variables.

In fact, it takes up more memory in storing a real variable than it does when storing an integer.

This isn't surprising, since real variables have to remember all the fiddly decimal bits, as well as the whole part of the number.

The way we measure memory is in bytes – as a rule of thumb, you can store one letter in one byte of memory. So ABCD would take up four bytes just for its own characters.

Numbers are a special case – I'll spare you the grim details. Unlike strings, where the number of bytes you need depends on the number of characters in the string, each number is stored in a fixed amount of bytes.

Integer variables take up four bytes each. Mind you, there's only so much you can cram in there.

As we found last month, there's an upper limit – though at 2,147 million I don't think we can complain much.

Reals, however, take five bytes each, using what's known as floating point notation.

Basically, what they try to do is remember as many of the digits in the number as possible, using four bytes – almost like in integers.

The fifth byte stores the exponent – that is how many tens you multiply by – needed to change the four digits into approximately the number you wish. This is very similar to the 1E9 notation we saw last month.

Notice the word approximately – this method does its best, but it cannot guarantee accuracy. After all, you've only got one more byte to remember things in than you had with the integers, and yet you're trying to cover bigger numbers and still include decimals.

To see what I mean try:

```
A=1.5555555555555555
PRINT A
```

You should get 1.55555556.

Okay, so it's not spot on ... but the error is well below a millionth.

Don't become complacent about this high level of accuracy – nobody enjoys receiving a gas bill for £63.99999999!

Run Program I and enter 1000. You should get the same results as you did last month when you ran Program IV. (If you didn't save it, and want to check, I've listed it again as Program II.)

```
   10 REM *** PROGRAM II ***
   20 MODE 6
   30 VDU 14
   40 INPUT "Maximum number", max%
   50 DIM square%(max%),cube%(max%)
   60 FOR loop%=0 TO max%
   70 square%(loop%)=loop%*loop%
   80 cube%(loop%)=loop%*loop%*loop%
   90 NEXT loop%
  100 FOR loop%=0 TO max%
  110 PRINT loop%, square%(loop%),
cube%(loop%)
  120 NEXT loop%
  130 VDU 15
```

Try running both programs entering 2500 as the maximum – use 2000 if you have a DFS.

On Program I, which uses real variables, you'll get the error message:

DIM space at line 50

whereas Program II, which uses integers, will give you:

Too big at line 80

The point is, when you DIM a numeric variable array, the micro is bright enough to work out how much memory you need in total – since it knows how many bytes each variable in the array will take.

If you haven't got enough room you

→

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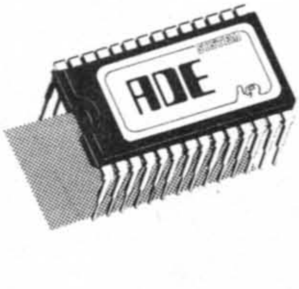

The ASSEMBLER features macros with library facilities; nestable conditional assembly; flexible listing options (with or without macro expansion); hex, decimal, binary and ASCII data formats; dummy section; full range of arithmetic and logical operators; symbol table sort and dump; file chaining and 29 powerful pseudo ops. Source and object files are kept on disc so there is no limit on program size or location.

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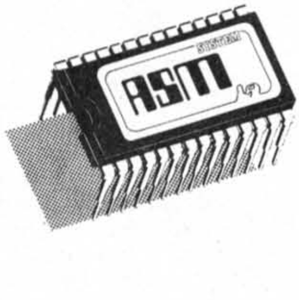

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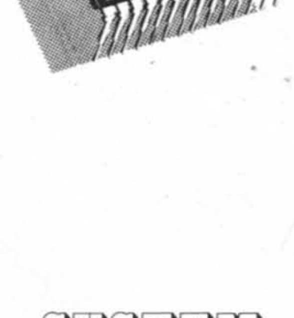

SPY2 features a versatile disassembler with hex dump, full and intelligent disassembly. This identifies data areas in the program; these being displayed as a hex/ASCII dump. Operating system calls are labelled creating very readable code. The powerful trace facilities enable program instructions and register contents to be traced to printer whilst the program is running. Indispensable for graphics programs as they can be stepped through whilst observing the effects on the screen.

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SYSTEM

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From Page 45

get the DIM space error message.

Now integer variables take up one byte less memory each, so you get away with dimensioning, or allocating, enough memory for your 2500 variables. However you fall foul of the limitations on the size of numeric variables and so get the "Too big" message.

The reason I suggested 2000 for discs rather than 2500 is because, when you have a DFS fitted, it grabs some of your micro's memory.

Since there's less memory left, it means the above "effects" happen earlier.

This memory stealing habit of the DFS is why many programs need "downloading" in order to run. This means you load the program in, then tell the micro the DFS isn't there and steal back the memory!

If you have a DFS and get a Bad Mode or DIM space message, it's six to four on you need a downloader. See the July 1984 issue of *The Micro User* for the remedy.

To return to the subject, even with integers, if you want too many variables or elements in your array you'll get a DIM space message.

However, accuracy and memory size aren't the only differences between real and integer numerics. The fact is, integers are far quicker than reals at doing sums.

To show this, we'll need to take a rather fascinating detour. Try Program III:

```
10 REM *** PROGRAM III ***
20 MODE 6
30 TIME=0
40 REPEAT
50 UNTIL TIME=500
60 VDU 7
```

TIME is a variable that the BBC Micro increases by one every hundredth of a second.

When you switch on the micro, TIME is at zero, but it increases by one every hundredth of a second.

You can change the value of TIME by assigning it a value, as you would a variable, but as soon as you do it keeps on increasing by one every hundredth of a second!

This is exactly what we do in Program III.

Line 30 sets TIME to zero and then lines 40 and 50 patiently repeat doing nothing at all until TIME equals 500. You then drop out of the bottom of the loop.

Line 60 then does a VDU 7 which causes the micro to beep.

The whole thing should take about five seconds – at least to the accuracy with which you'll be able to press your stopwatch!

'..integers are far quicker than reals at doing sums'

To prove that TIME really is varying, add:

```
45 PRINT TIME
```

Sometimes, however, although you want to time something, you don't want to fiddle with the actual value of TIME – you may be already using it to time something else, for instance.

This is no problem. All you have to do is store the value of TIME in a variable at the start of the timing period, then keep on checking until TIME has increased past the old, stored value of TIME plus the period you're timing.

In Program IV we save the value of TIME with:

```
30 time% = TIME
```

We repeat until TIME is more than 500 greater than this same value, as in line 50:

```
50 UNTIL TIME - time% > 500
```

The whole thing does exactly the same as Program III without interfering with the actual value of TIME which is still ticking away in the micro, increasing by one every hundredth of a second.

To show the difference, add:

```
45 PRINT TIME
```

and run the program.

To return to our discussion of Programs I and II, and the differences between numeric and integer variables. TIME allows us to time the difference in speed between Program I, with its integer variables, and Program II, with its numeric variables.

We'll need to make some alterations. Lines 30 and 130 will have to go – after all, we don't want to time the micro waiting for us to press Shift!

Next add the following lines:

```
55 TIME = 0
```

and:

```
130 PRINT "Time taken was "; TIME/100;
" seconds."
```

These amendments should let us know how long it takes to calculate and print out the squares and cubes.

Try a maximum of 100 with both programs and you should find that integers are faster than numerics – though not by much. In my case, it was four seconds for integers as opposed to 4.38 for the reals.

When you think about it, though, we're not just timing the calculations, we're also timing how long it took to put them on the screen.

To make it fairer, lets get rid of the printing-out loop, lines 100-120, in both programs, with:

```
DELETE 100,120
```

If you now run both for a maximum of 100, you'll see how much time was taken up simply printing things out! Also you'll see that the integer variables are far faster than the reals.

My times were 0.54 seconds for the integer and 0.88 seconds for the real – a saving of about 40 per cent.

So if you've got a lot of calculations, and don't need decimal accuracy – use integer variables.

Incidentally, if you get other values, don't worry. If you use a second processor, for instance, the times drop to 0.36 for integers and 0.59 for reals.

Well that's all for this month ... Next month it's time for something completely different!

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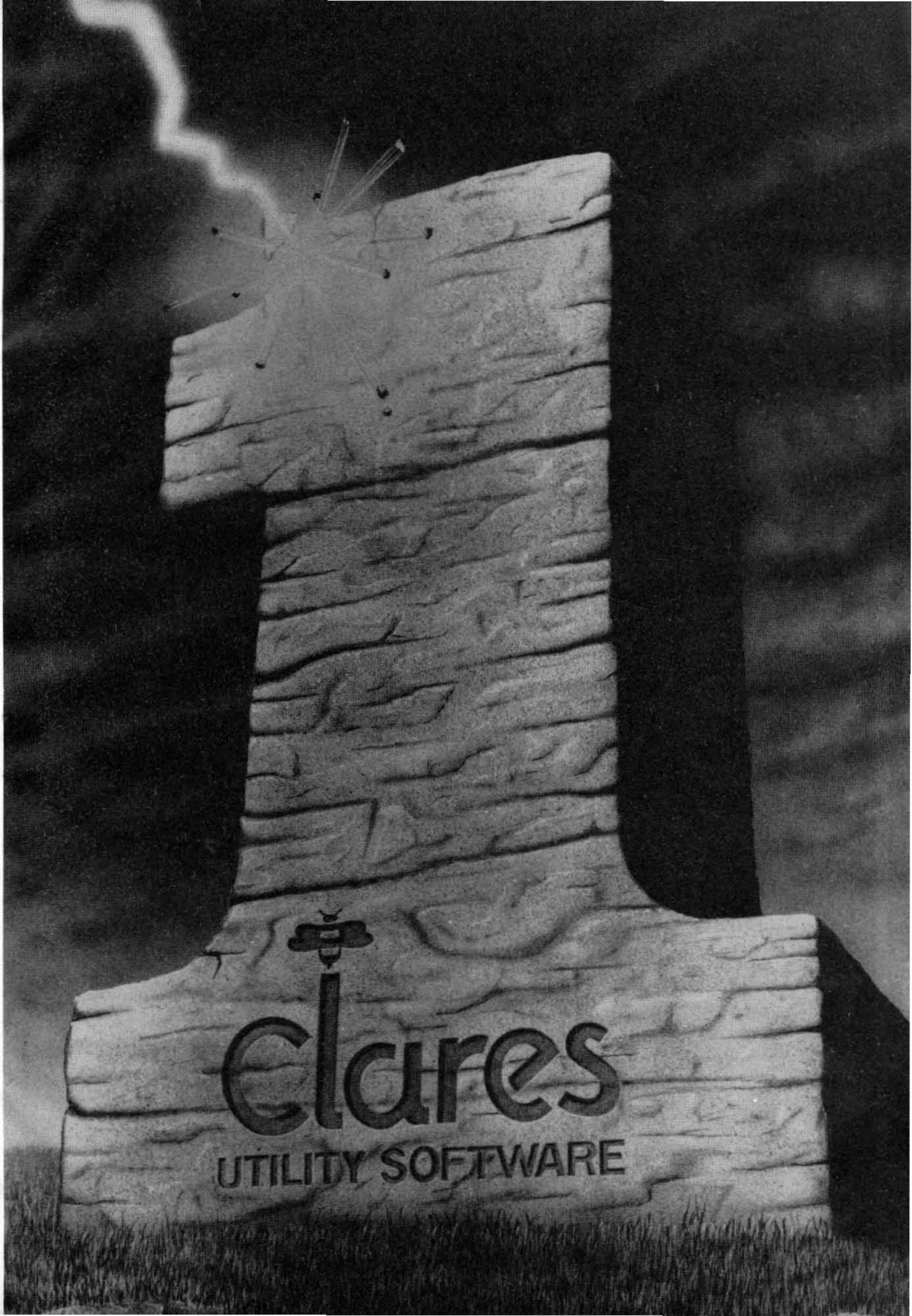
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UTILITY SOFTWARE

MODE 7

NIGEL PETERS continues his teletext tales . .

Getting to grips with graphics

IN my last article about Mode 7 I dealt with the way we can use control codes to produce coloured text and backgrounds. We also learnt how to make the text flash and how to produce double height letters.

Now we'll go into using Mode 7's graphics capabilities. Although rather crude compared with the BBC Micro's other modes, Mode 7 can produce some entertaining displays as a glance at Ceefax or Oracle will show.

As we might expect from our earlier experiences, we access these graphics capabilities by making use of control codes. These tell the micro that instead of text it is to display block graphics.

These are rectangles made up of six squares, as shown in Figure I. Each block is the size of a capital letter.

Each of the six squares making up a block can be either on (that is, the foreground colour is shown) or off (the square is the background colour).

Lighting various combinations of these squares allows the micro to have available 64 different graphics characters. Figure II shows the shapes on offer.

When we want the micro to produce block graphics we use one of the control codes shown in Table I.

As you can see from this, seven codes are available. If we wanted to have red block graphics we would use:

```
PRINT CHR$(145)
```

in just the same way as previously we used:

```
PRINT CHR$(129)
```

to get red text.

However we have 64 block graphics characters to choose from. We have to tell the micro not only that we want block graphics and, at the same time, their colour, but also which character we want. This is done by using another set of control codes, those from 160 to 191 and 224 to 255.

The control codes and the character they refer to are shown in Figure II. Run Program I and you'll see them on the screen. The CHR$(145) picks red graphics while the FOR . . . NEXT loops decide which blocks appear.

Code number	Graphics colour
145	red
146	green
147	yellow
148	blue
149	magenta
150	cyan
151	white

Table I: Block graphics codes

```
10 REM PROGRAM I
20 FOR code= 160 TO 191
30 PRINT code,CHR$(145)CHR$(code)
40 PRINT
50 NEXT code
60 FOR code= 224 TO 255
70 PRINT code,CHR$(145)CHR$(code)
80 PRINT
90 NEXT code
```

These shapes can be combined in many different ways to produce quite effective displays. Use PRINT and TAB along with Figure II and Table I to try your hand at Mode 7 graphics.

It's not hard, you just have to remember where on the screen each of the characters has to go and that the control codes, although invisible, take up a space.

You'll be pleased to know that the codes we learnt in the last article also

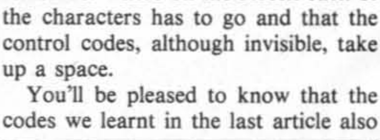


Figure I: Block graphics characters

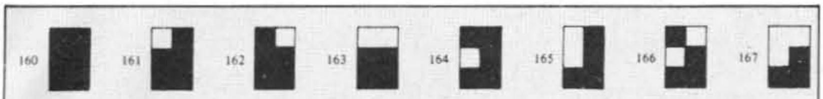


Figure II: Graphics characters and their codes

work with graphics characters. Program II shows them in action.

```
10 REM PROGRAM II
20 PRINT"DIFFERENT BACKGROUND COLO
UR"
30 PRINT CHR$(130)CHR$(157)CHR$(14
8)CHR$(230)
40 PRINT"FLASHING"
50 PRINT CHR$(130)CHR$(157)CHR$(13
6)CHR$(148)CHR$(230)
60 PRINT"DOUBLE HEIGHT"
70 PRINT CHR$(130)CHR$(157)CHR$(13
6)CHR$(148)CHR$(141)CHR$(230)
80 PRINT CHR$(130)CHR$(157)CHR$(13
6)CHR$(148)CHR$(141)CHR$(230)
```

It's not always easy to remember what the code for a particular character is. Of course they're all shown in Figure II and on page 488 of the User Guide, but these may not always be available.

1	2
4	8
16	64

Figure III: Square values

Happily there is a way of calculating the control code of a character. Each of the squares that makes a Mode 7 graphics character has a value, as shown in Figure III.

All you do when you want to know a character's code is to decide which squares are going to be in the foreground colour. Then total the values of those squares and add 160. The result is the control code for that character.

Although it sounds complicated, it's quite simple in practice. Certainly I find it a lot easier than looking through the lists when the character I want invariably seems to hide. Figure IV shows a sample calculation.

As you might guess, we can use combinations of the various graphics blocks to produce something akin to user defined characters. If we wanted, for reasons best known to ourselves, to produce a cyan figure 8 three lines deep then we could use Program III.

```
10 REM PROGRAM III
20 PRINT CHR$(150)CHR$(183)CHR$(23
5)
30 PRINT CHR$(150)CHR$(189)CHR$(23
8)
40 PRINT CHR$(150)CHR$(245)CHR$(25
0)
```

Here the CHR$(150) tells the micro that we want cyan block graphics while the other six codes define which shapes are to be used. Try varying the program with your own choice of character shapes.

Now after having given you Figure II, which lists the shapes available and their codes, I'll tell you that there's a different way of getting the blocks.

If you follow one of the graphics control codes with a string made up of lower case letters, numbers or punctuation marks you'll get graphics characters, not the letters or symbols you might expect.

Program IV shows this in action for each of the lower case letters of the alphabet.

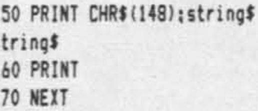
```
10 REM PROGRAM IV
20 FOR x=1 TO 26
30 alphabet$="abcdefghijklmnopqrst
uvwxyz"
40 string$=MID$(alphabet$,x,1)
50 PRINT CHR$(148);string$ CHR$(12
9)string$
60 PRINT
70 NEXT
```

The full set of symbols and the graphics characters they give are shown in Figure V.

Using this method we could produce our large 8 – magenta this time – in a much shorter program. Program V shows how this is done.

```
10 REM PROGRAM V
20 PRINT CHR$(149)"7k"
30 PRINT CHR$(149)"=n"
40 PRINT CHR$(149)"uz"
```

We could even replace three lines with one by using the control codes 10 and 8 to move the print cursor one space



Code number = 2+4+16+160 = 182

Figure IV: Calculating codes

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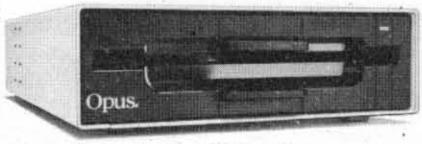

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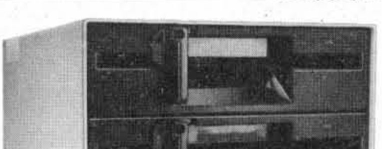

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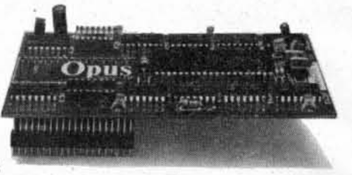

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From Page 51

down and one space left respectively. This is shown in Program VI.

```
   10 REM PROGRAM VI
   20 PRINT CHR$(149)"7k"CHR$(10)CHR$
(8)CHR$(8)CHR$(8)CHR$(149)"=n"CHR$(10
)CHR$(8)CHR$(8)CHR$(8)CHR$(149)"uz"
```

You'll notice that the whole thing is getting more and more like a user defined character, and you may be wondering if we could replace all those CHR$s with a string of VDUs as we did at the end of the last article. The answer is yes, we can – and Program VII shows how it's done.

```
   10 REM PROGRAM VII
   20 VDU 149,183,235,10,8,8,8,149,18
9,238,10,8,8,8,149,245,250,10
```

It's much neater, but for the rest of the programs in this article I'll stick to using CHR$. I think it makes things a little clearer.

If you're wondering what that last control code does, it just puts the prompt on the next line. Try leaving it out and see what happens.

Because the 149 code is still working on that line, the prompt is interpreted as a block graphics character with ugly results.

Before you read on, just make sure that you understand what we've covered above. Have a go at producing your own Mode 7 shapes on screen, using any of the methods outlined above.

You'll find that, with a little practice, it's quite easy to do.

Having got so far, now's the time to tell you that we've only dealt with one of the two forms of block graphics available in Mode 7.

We've been using contiguous block graphics. We could also have used something called separated graphics. Program VIII, a variant of Program IV, shows the difference.

```
   10 REM PROGRAM VIII
   20 FOR x=1 TO 26
   30 alphabet$="abcdefghijklmnopqrst
uvwxyz"
   40 string$=MID$(alphabet$,x,1)
   50 PRINT"CONTIGUOUS SEPARATE"
   60 PRINTCHR$(148);string$,CHR$(154
);string$
   70 NEXT
```

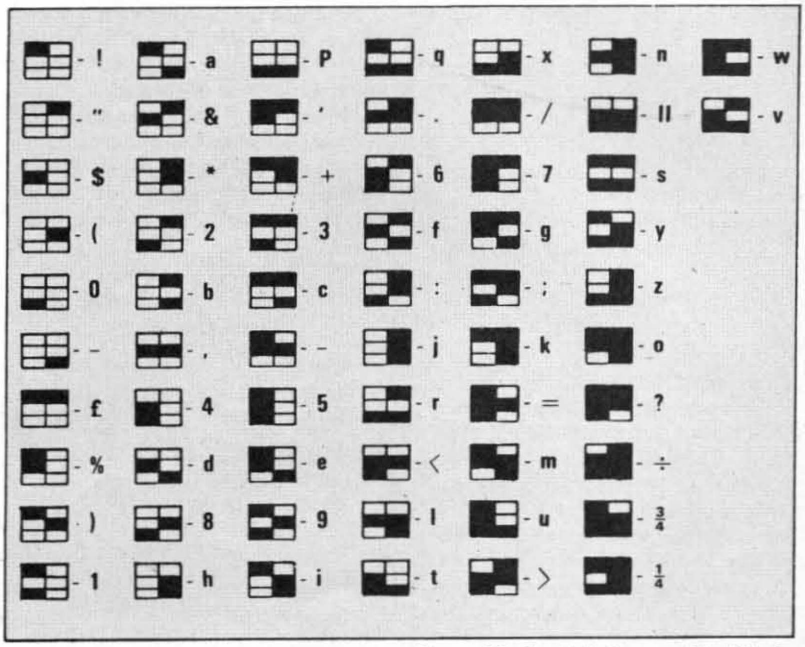

Figure V: Symbols for graphics blocks

As you can see, contiguous graphics have all the squares that make them up joined together. Separated graphics have all the six squares which make up that character separated by the background colour.

It's as though there's a border around each square, and consequently between adjoining characters on the same line. You get the "skeleton" of the block.

Contiguous block graphics are the default – the micro will use them unless you tell it differently. You can switch to separated graphics by using the control code 154 and back to contiguous graphics with control code 153.

Which you use depends on what effect you want. At times separated graphics look much neater than contiguous ones.

Try out some of the earlier programs using CHR$(154) to get separated graphics and see what you think.

```
        10 REM PROGRAM IX
        20 PRINT CHR$(147);
        30 FOR repeat=1 TO 10
        40 PRINT CHR$(247);
        50 NEXT repeat
        60 PRINT CHR$(148);
        70 FOR repeat=1 TO 10
        80 PRINT CHR$(251);
        90 NEXT repeat
       100 PRINT
```

While you've been playing around with Mode 7 you may have come up against the fact that the control codes, although invisible, take up a space on the screen.

While this doesn't matter too much in text, it can mess up graphics displays. You don't want gaps all over your beautiful artwork. Run Program IX and you'll see what I mean.

The program gives the 20 shapes required, but that gap in the middle spoils the effect. That's where the control code 148 is hiding.

You might have wondered if there was a way round this effect and there is, using yet another set of control codes.

Control code 158 has the effect of holding the graphics. What this means is that when you use that code in a line the micro will carry on printing out the required block graphics characters.

However when it comes to another control code, instead of leaving a space as normal it fills that space in. It does this with the same graphics character as the last one it used. So by using the hold graphics code the ugly gap of Program

→

From Page 53

IX can be avoided. Program X shows how this is done.

```
  10 REM PROGRAM X
  20 PRINT CHR$(147);
  30 FOR repeat=1 TO 10
  40 PRINT CHR$(247);
  50 NEXT repeat
  60 PRINT CHR$(158)CHR$(148);
  70 FOR repeat=1 TO 10
  80 PRINT CHR$(251);
  90 NEXT repeat
 100 PRINT
```

Eagle-eyed readers will have spotted that, although the lines are joined, there are 11 of the first character and 10 of the second. The space of Program IX has been filled in with the previous block graphics character.

This holding effect can be switched off. The control code 159 returns the rest of the line to the normal way of things, where control codes appear as spaces.

And that's nearly the end, apart from one last control code, 152. This conceals the display.

Anything that comes in a line after a 152 is automatically the background colour. This, of course, means that you can't see the rest of the line.

Printing something on the screen that you can't see may sound a bit daft but it does have its point. By printing a message on the screen invisibly and then overprinting the 152 control code with a space you can make things appear as if by magic. In a way, it's the Mode 7 version of VDU 19.

```
   10 REM PROGRAM XI
   20 CLS
   30 PRINT TAB(1,11)CHR$(130)CHR$(15
2)"GREEN"
   40 PRINTTAB(1,12)CHR$(131)CHR$(152
)"YELLOW"
   50 PRINTTAB(1,13)CHR$(132)CHR$(152
)"BLUE"
   60 PRINT TAB(1,23)"PRESS SPACE FOR
 NEXT COLOUR"
   70 FOR X=11 TO 13
   80 WAIT$=GET$
   90 PRINT TAB(2,X)" "
  100 NEXT
```

Program XI shows you the conceal display control code in action. You don't see the messages until the code is overwritten with a space.

And that's the end of our tour of Mode 7. Table II sums up these last control codes.

Control code	Result
152	Conceal display
153	Contiguous graphics
154	Separated graphics
158	Hold graphics
159	Release graphics

Table II: Graphics control codes

As you can see, the basics of the mode are quite simple, but the effects obtained using the control codes can be complicated. And the great advantage is that you aren't using up lots of precious memory.

Have fun!

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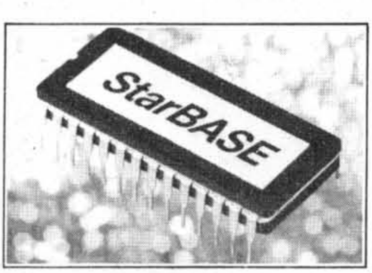

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MAKE THE MOST OF YOUR JOYSTICK

When you bought your BBC Model B, or a PLUS 1 or one of the other analogue interfaces for the ELECTRON, then you paid out a fair amount of money for the A/D converter. Don't waste it by buying switched joysticks. ACORN did not put all this additional cost onto the machines without considering its worth against a switched joystick option which could have been run from the user port without any additional hardware.

A switched joystick cannot properly simulate an analogue one but an analogue one can simulate a switched one with extra facilities.

Three types of joystick are around for the BBC at the moment. These are:-

(a) Switched type that plugs into the user port.

(b) Switched type modified to plug into the analogue port.

(c) Fully analogue.

Firstly, don't buy a switched joystick that plugs into the user port. Joystick software for the BBC is written to run from the analogue port. A joystick of this type will need a conversion routine, even to run programs that have an ACORNSOFT compatible joystick option. Conversion software can cause problems, it can interact with the hardware timers in the user port, or affect the speed of the game, or sometimes the conversion cannot be located because all available memory is used.

The switched type of joystick that plugs into the analogue port has been fitted with resistors to give three values in any plane. These values are full on, full off or half way. This type of joystick will run programs which only require up, down, left, right or diagonal movement in one speed.

The type of joystick really intended to be used on the BBC is a fully analogue one. Few programs are around yet which really take advantage of the variable rates and angles that can be used with this type. Two programs that do are AVIATOR and SNOOKER from ACORNSOFT and you need analogue joysticks to play the joystick versions of these programs.

On AVIATOR the joystick replaces the real Spitfire's joystick. A slight movement of the joystick will cause the plane to change direction slowly and a large movement will make it change direction sharply.

In SNOOKER the angle of the shot is directly related to the angle of the joystick and the strength of the shot is determined by the deflection of the joystick from the centre position.

Most things in real life are analogue. For instance, imagine driving a car with only idle or flat out, forwards or backwards and brakes that were either hard on with the wheels locked or not on at all. Imagine picking up an egg with a hand that was either open or fully closed. An attempt can be made to simulate analogue movement with switches by causing the switch to adjust the rate at which something is moved. The keyboard version of AVIATOR is like this—as long as you hold down a key the aircraft joystick is moved in that direction—O.K until you need to suddenly swing the other way because you will have to wait while the joystick is driven back to centre and then off in the other direction.

In the on-going debate as to whether video games are good or bad for young children; one of the "for's" is that they improve co-ordination between hand and eye. This is only true if there is a direct relationship beween the position of the hand (joystick) and the object on the screen. It is not really improving co-ordination if the object moves at a rate determined by software regardless of the relative position of the stick or the pressure applied to it or the speed that is moved.

Similarly the absolute position of a cursor in a graphics program is best done with analogue joysticks. The cursor can be moved a tiny bit by making a fine adjustment in any direction or can be put the other side of the screen as quick as the joystick can be moved.

To help you make the most of your joystick we are offering free listings of some useful joystick utilities for just sending us a stamped addressed envelope and returning the enclosed form.

by *Tony Pearmain*

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Please answer these quesitons:-

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If yes please give make ....

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Teletext screen dump

INTEREST in Mode 7 has greatly increased over the past few months. Its economical use of memory is especially important if you also have a DFS, which reserves nearly 4k for its own use.

Also access to transmitted screens is becoming more common with Prestel, Micronet, Ceefax and Oracle.

With this interest comes the need to dump screens of information onto a printer.

But before this can be done a number of problems need to be overcome.

Teletext characters are divided into both printable and control characters, which are responsible for the many special effects that can be produced.

These control codes have an effect on all the rest of the characters on that screen line unless a control code to cancel or alter the command is given.

For example, if the control code 129 is found at the start of the line, all the rest of the characters will be printed in red.

However if that code is 145, instead of the normal keyboard characters (except for upper case letters), graphics symbols will be printed instead. These form part of a 3 x 2 mosaic, the parts that are printed depending on the Ascii value of the character *(see Figure I)*.

As a further complication, these graphics can be printed together or slightly separated. It is also possible for characters to be printed double height.

1	2
4	8
16	64

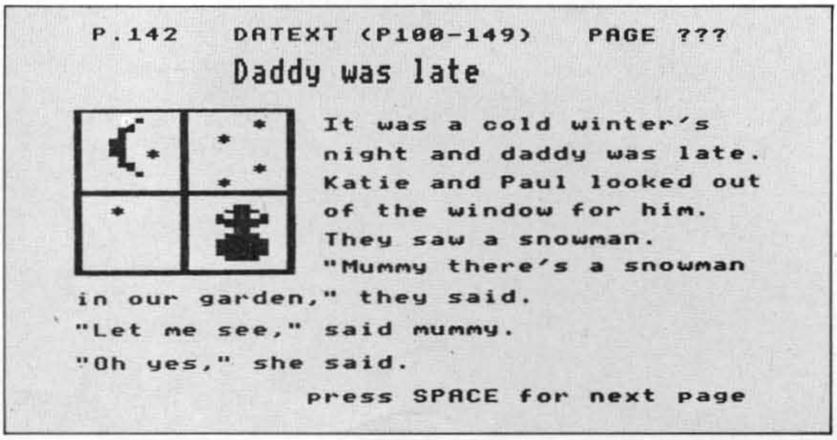
To find the Ascii value of a graphics character add together the value of each part of the mosaic that is to be printed, then add 32.

Figure I

Another problem is that a number of the characters differ between Modes 0-6 and Mode 7 *(see Figure II)*.

Mode 7 has its own character generator which uses different numbers for some characters to those used in Modes 0-6 *(see Figure III)*.

In normal use you are unaware of this

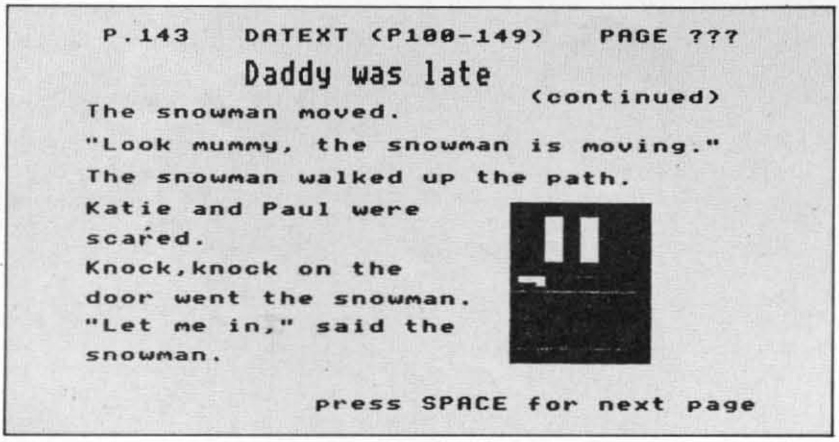


P.142 DATEXT (P100-149) PAGE ???

Daddy was late

It was a cold winter's
night and daddy was late.
Katie and Paul looked out
of the window for him.
They saw a snowman.
"Mummy there's a snowman
in our garden," they said.
"Let me see," said mummy.
"Oh yes," she said.

press SPACE for next page

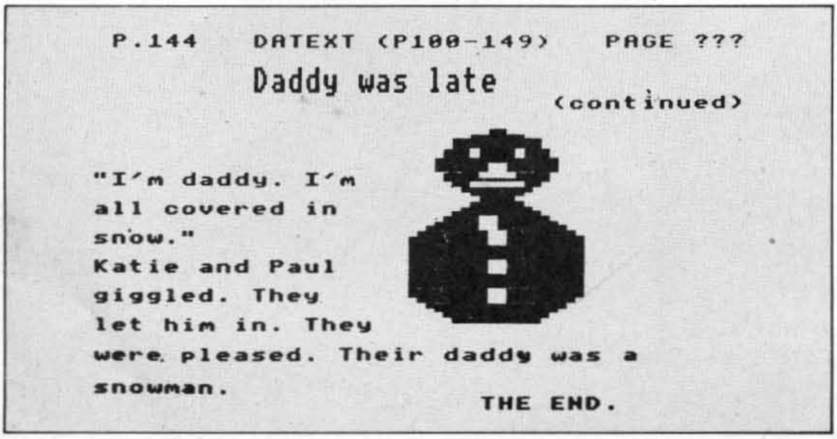


P.143 DATEXT (P100-149) PAGE ???

Daddy was late (continued)

The snowman moved.
"Look mummy, the snowman is moving."
The snowman walked up the path.
Katie and Paul were
scared.
Knock,knock on the
door went the snowman.
"Let me in," said the
snowman.

press SPACE for next page



P.144 DATEXT (P100-149) PAGE ???

Daddy was late (continued)

"I'm daddy. I'm
all covered in
snow."
Katie and Paul
giggled. They
let him in. They
were pleased. Their daddy was a
snowman.

THE END.

PROGRAM DESCRIPTION

Lines	
50	PROCinit defines the non-standard characters required for Mode 7.
60	Loads the screen file that is going to be dumped.
70	Points to the error handling routine.
80	Enable output to printer.
90	Makes sure that the printer starts on a new line.
100	Loop counter for the screen rows.
110	Resets these flags at the start of each line.
120	A command to the printer telling it to expect 320 bytes of 8 bit graphic data.
130	Loop counter for each character position in the current row.
140	Moves current text pointer.
150	Gives the Ascii value of the character under the text pointer.
160-210	Sets program flags according to any teletext control codes.
220	If it was a control code or a 'space', sends a series of 8 zeros to the printer.
230	GOTO the graphics routine if the graphics flag has been set, but not if the character is upper case or a #.
240	Swaps certain characters around so that the character set 160-254 is the same as those 32-126.
250	Picks out the teletext characters which differ in Modes 0-6.
260	Prints a "normal" character.
280	**close** is a flag which is set if the previous line had a double height or graphics character. If **close** is set, a printer command is sent so that adjacent lines are placed together, otherwise there is a small gap to aid legibility with text characters.
290	If your printer needs a line feed (char. 10) to go onto the next line – that is, you have to type in *FX6 before you normally do any printing – make sure you include the 10 in the statement, otherwise it can be omitted.
320	This is important if the Escape key is pressed during the dump. After the command on line 120 the printer expects 320 bytes of graphic information. If it doesn't the results are, to say the least, interesting!
380-420	Sets up some variables and flags.
430-520	Defines those characters which differ between Mode 7 and the other modes.
530	Assembles a short piece of machine code.
570-580	Flags and pointers which let the program know whether it is the upper part or the lower part or a double height character that is to be printed.
620-730	Calculates values for a character definition according to the formula given in Figure I. Since defined characters have an 8 x 8 matrix and teletext graphics have a 3 x 2 format, the top and bottom graphics blocks are given three lines each while the middle blocks are given two.
740	Alters the graphics variables if the separate graphics flag is set.
750	Defines character 226.
760	*s%* is a pointer to the defined character.
770	Gives the defined character to the output routine.
810-830	Works out the offset to the defined character table in page &C00 (as defined by PROCinit).
840	Points to the defined character for the output routine.
880-890	All the characters of Mode 0 to 6 are defined in the operating system starting at &C000. *s%* will point to the start of the character definition.
900	Points to the character definition for the output routine.
940	When the double height flag is set, this routine checks whether it is the top or bottom line of the character . . .
950	. . . then either the top line or the bottom line is copied to another location, doubling its height in the process.
990	Enlarges character if necessary.
1000	!&80 points to the start of the character definition.
1010	!&82 points to the locations where the manipulated character is to be placed.
1020	Calls the machine code manipulation routine.
1030	Outputs the character to the printer.
1070-1590	Assemble the character manipulation routine.
1640-1670	Simple routine to load a Mode 7 screen file.

because the operating system swaps them around without you knowing. To confirm this try this experiment.

After the screen has been cleared, type in:

```
?&7C00=35
```

A £ sign will appear in the top left of the screen. Now type in:

```
VDU 35
```

This time a #sign will be printed, confirming that character number 35 can appear differently depending on whether it is printed using the operating system or placed in the screen memory directly.

There are a number of different ways a teletext screen dump program can be written:

- The Mode 7 display could be converted into another screen mode and then put on a printer using a standard screen dump routine. *(You'll run out of memory if you add this program onto another one.)*
- Define all the special characters required in the printer itself. *(OK if you have a printer in which characters can be defined – even the best printers find this task daunting if all possible teletext characters are to be translated.)*
- Stay in Mode 7, but give the printer

→

Ascii	Mode 7	Mode 0 to 6
91	←	[
92	½	\
93	→	]
94	↑	^
95	–	_
123	¼	{
124	‖	¦
125	¾	}
126	÷	~
255	■	

Figure II: Different characters in Mode 7 and Modes 0 to 6

Teletext Internal Number	Converted to	
95	35	#
96	95	–
35	96	£

Figure III: "Swap around" character.

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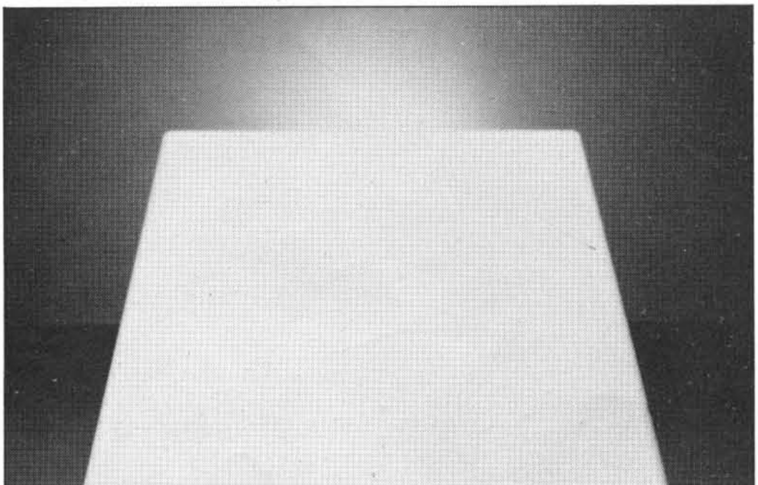

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Track density	100 TP1	100 TP1
Total number of tracks	40 (each side)	40 (each side)
Recording method	FM	MFM
Rotational speed	300 RPM	300 RPM
Transfer rate	125K Bits/Sec	250K Bits/Sec
Access time track to track	3 ms	3 ms
Access time settling	20 ms	20 ms
Motor start time	0.5 sec	0.5 sec

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From Page 57

the information it would have received from a screen dump. *(Not the easiest way, but a good challenge!)*

Basically, the method chosen for the program described here is to send a stream of graphics data for what the printers term an 8 bit graphics dump. The information for each character is sent as a series of 8 bytes.

For normal characters this information is found in a table in the operating system starting at &C000. This contains the definitions for the characters of Mode 0-6.

The characters which vary from Mode 7 are defined by the program and placed on page &C. The graphics characters are decoded according to their Ascii number and the definition put in page &C starting at &C10.

If any of these characters is to be double height, the single height character is "expanded" and the definition placed in page &C starting at &C08.

When characters are defined using VDU23, or are predefined in the character table in the operating system, they are defined from top to bottom in *rows* in line with the way that the TV screen is normally scanned.

Printers however usually print *columns* of vertical dots to make up a character.

To translate these VDU definitions into a form which a printer with 8 bit imaging can understand, a short machine code routine is used as Basic would be too slow.

The output definition is also stored on page &C starting at &C00.

The program is designed to be compatible with Basic I and Basic II. If you only want to use this program with Basic II, replace line 1650 with:

```
OSCLII"LOAD "+file$+" 7C00"
```

and delete 1660 and 1670.

As written, this program works with Epson printers such as the FX80 and RX80. Conversion to other printers with an 8 bit imaging mode is possible by changing the commands in certain lines:

120 Tells the printer to expect 320 bytes of 8 bit graphic data.

280 Is concerned with the spacing between lines.

290 Commands for carriage return and line feed.

330 Command to reset the printer.

This program can be made to occupy less space in memory by saving the character definitions and machine code separately.

After the program has been typed in, tested and saved, clear the memory with:

```
*FX200,3
```

and press the Break key.

Load in the program and enter:

```
PROCinit
```

to define different characters and assemble the machine code on page &C.

Save these with:

```
*SAVE code C00 +FF
```

Lines 430-520 and 1060-1600 can now be deleted. Alter line 530 to:

```
*LOAD code
```

then save the shortened Basic program.

Remember in future that *code* must always be available for loading after the Basic.

Teletext listing

```
 10 REM Teletext Screen Dump
 20 REM Jim Notman (c) 1984
 30
 40 MODE 7
 50 PROCinit
 60 PROCload
 70 ON ERROR GOTO 320
 80 VDU 2
 90 PRINT
100 FOR Y%=0TO 24
110 graph=FALSE
    :double=FALSE
    :separate=FALSE
    :close=FALSE
120 VDU 1,27,1,75,1,64,1,1
130 FOR X%=0TO 39
140 VDU 31,X%,Y%
150 R%=(USR (&FFF4)AND &FFFF)
    DIV 256
160 IF R%>128 AND R%<136
    THEN graph=FALSE
170 IF R%=140
    THEN double=FALSE
180 IF R%=141
    THEN double=TRUE
    :close=TRUE
    :PROCsetline
190 IF R%>144 AND R%<152
    THEN graph=TRUE
    :close=TRUE
200 IF R%=153
    THEN separate=FALSE
210 IF R%=154
    THEN separate=TRUE
220 IF (R%AND &7F)<33
    THEN FOR L%=0TO 7
    :VDU 1,0
    :NEXT
    :GOTO 270
230 IF graph=TRUE AND NOT (R%=35
     OR (R%>63 AND R%<95)OR (R%>191
    AND R%<224))
    THEN PROCgraph(R%)
    :GOTO 270
240 IF R%=163
    THEN R%=96
    ELSE IF R%=223
    THEN R%=35
    ELSE IF R%=224
    THEN R%=95
250 IF (R%>90AND R%<96)OR (R%>122
    AND R%<128)OR (R%>218AND R%<223)
    OR (R%>250AND R%<256)
    THEN PROCdiff(R%)
    :GOTO 270
260 PROCprint(R%)
270 NEXT
280 IF close=TRUE
    THEN VDU 1,27,1,65,1,8
    ELSE VDU 1,27,1,65,1,9
290 VDU 1,13,1,10
300 NEXT
310 VDU 26
320 IF J%<41
    THEN FOR L%=0TO (41-J%)*8
    :VDU 1,0
    :NEXT
330 VDU 1,27,1,64,3
340 IF ERR <>0
    THEN REPORT
    :PRINT " on line ";ERL
350 END
360
370 DEF PROCinit
380 A%=135
    :p%=&C00
    :m%=&C08
    :b%=&C000
390 DIM cmd% 25
400 setline=-2
410 top=FALSE
420 bottom=FALSE
430 VDU 23,227,0,16,32,127,32,16
    ,0,0
440 VDU 23,228,64,64,64,76,82,4
    ,8,30
450 VDU 23,229,0,4,2,127,2,4,0
    ,0
```

→

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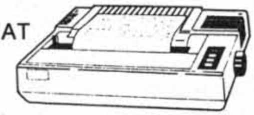

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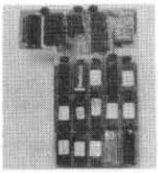

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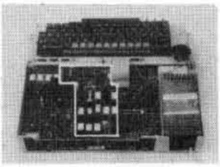

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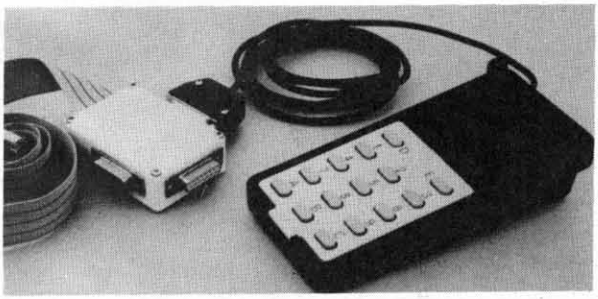

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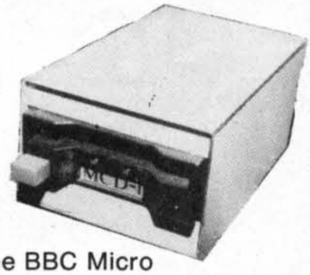

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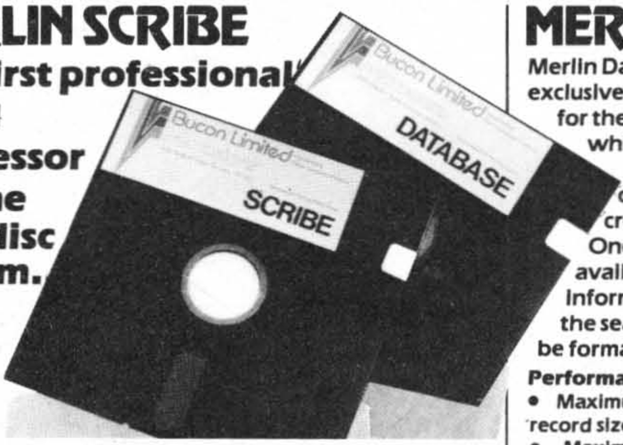

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Start of a new 3-part series

PETER JOHNSON describes the new assembly instructions available on the second processor

How to save both time and memory

THERE are two obvious ways in which Acorn's new 6502 second processor gives the user more power. The first is its extra speed – the clock rate is 3MHz compared with the 2MHz of the I/O processor (the BBC Micro).

In addition, the second processor is interrupted far less frequently than the I/O processor as it has no keyboard or other devices to service. These factors result in a speed increase of 50-65 per cent.

The other powerful feature is the extra memory the second processor provides. There is 44k available to the Basic programmer when HiBasic is used and 60k available to machine code programmers.

There is also a less well-known extra that the second processor gives – an enhanced instruction set.

The 6502 used in the parasite (another name for the second processor) is not the common or garden NMOS version used in the host (another name for the BBC Micro!), but a souped-up CMOS version made by, among others, GTE.

The official designation for this chip is G65SC02, though there are other similar ones such as the 65SC12 which have the same instruction set but slightly different hardware characteristics.

The purpose of this series of articles is twofold. Firstly, it introduces the new 65SC02 instructions, explaining how they save bytes and microseconds.

Secondly it explains a way of assembling the new instructions using the HiBasic assembler directives.

I assume that the reader has a fairly good knowledge of the standard 6502, so I won't attempt to teach assembly language programming.

Table I summarises the new instructions.

I have grouped the extra 65C02 instructions into eight sets of similar operations, or address modes, for the purpose of explanation.

Before I start with a detailed description of the 27 instructions listed in Table I, it should be noted that there are another 32 instructions available on the Rockwell R65C02 family of chips that do not appear in the instruction set of the 65C02.

Acorn seems to have chosen the latter chip instead of the more powerful Rockwell version because it is more easily available. Whereas several companies manufacture the 65SC02, Rockwell is the only source of R65C02 chips. It's nice to see that Acorn has learnt a lesson from the scarcity of 8271 disc controllers, whose sole supplier is Intel.

It can be seen from Table I that the 65C02 instructions provide both new operations and extensions of existing ones. I will describe the new opcodes by group – the first four this month, the last four next month.

Group 1

This comprises eight existing instructions using a new addressing mode. This mode is zero page indirect and has previously been available only with some form of indexing.

Readers familiar with the standard 6502 instructions will notice that the eight instructions provided with zero page indirect are the same ones that currently allow post-indexed and pre-

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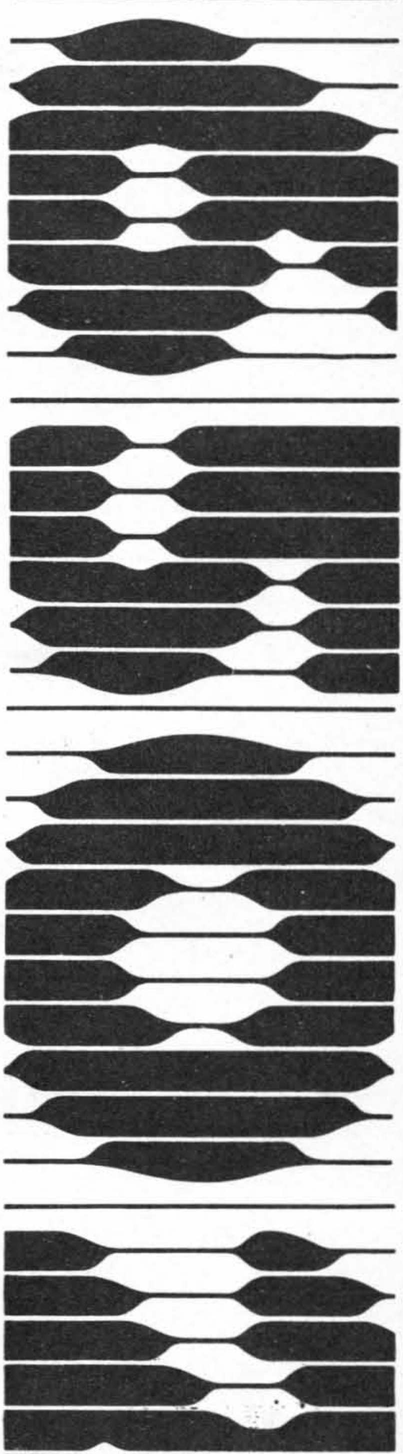

SECOND PROCESSOR

6502

Second processor

Part one

From Page 63

indexed indirect modes.

With zero page indirect, the required byte is found at the address given by two zero page bytes. The location of the first of these zero-page bytes is given in the operand of the instruction. This sounds complicated, but compare the two sequences given below – they have the same effect:

6502	65C02
LDY#0	LDA (tmp)
LDA (tmp),Y	

In both versions *tmp* is the address in zero page of the pointer to the (address of) the desired byte. On the BBC running under Basic, *tmp* might have the value &70, as that is where the user's workspace starts.

At *tmp* and *tmp+1* there would be the address of the byte to be loaded. It can be seen that by using the new instruction, two bytes of program – required by the LDY# 0 – have been saved. Moreover the Y register wasn't corrupted, and two clock cycles were saved.

Group 2

A fairly small group this, containing only one instruction. Incredibly, the designers of the original 6502 instruction set didn't include an unconditional branch instruction.

This was unfortunate as it meant that 6502 programmers either had to use JMP, which is one byte longer, or branch on some condition that they knew to be true. If no such condition could be assumed, one was often invented. For example:

6502	65C02
CLC	BRA label
BCC label	

In the first example the CLC was executed solely in order to make the branch succeed. In the 65C02 version the branch is executed without regard to the condition codes.

The advantage of this is that code can be made clearer by having explicitly unconditional branches, rather than inventing some contrived "always true" condition.

Like the rest of the branch instructions, the operand of BRA is a single byte which gives the displacement of the destination from the first byte of the next instruction.

This displacement is in the range –128 to 127, or –126 to 129 bytes from the branch instruction itself. A BRA &FE instruction will cause an infinite loop, and BRA 0 is effectively a NOP instruction.

Group 3

This adds new address modes to an existing instruction. The action of BIT is to AND its operand with the accumulator, setting the zero (Z) flag if the result is zero.

The accumulator is not affected. In addition, the negative (N) flag is set to the sign (most significant) bit of the operand, and the overflow (V) flag is set to the second most significant bit (bit 6, counting from zero) of the operand.

Usually the ANDing part of the instruction is ignored, and BIT is used to test the state of the top two bits of its operand. Out of interest, you may like to look at the possible values of A when the

→

Mnemonic	*Operation*	*NVZC*	*Opcode*	*Bytes*	*Cycles*
Group 1					
ORA (zp)	A=A OR M	N.Z.	&12	2	5
AND (zp)	A=A AND M	N.Z.	&32	2	5
EOR (zp)	A=A EOR M	N.Z.	&52	2	5
ADC (zp)	A=A+M+C	NVZC	&72	2	5
STA (zp)	M=A	....	&92	2	5
LDA (zp)	A=M	N.Z.	&B2	2	5
CMP (zp)	A–M	N.ZC	&D2	2	5
SBC (zp)	A=A–M–~C	NVZC	&F2	2	5
Group 2					
BRA rel	Branch by M	....	&80	2	3
Group 3					
BIT zp,X	A AND M	76.Z	&34	2	4
BIT abs,X	A AND M	76.Z	&3C	3	4
BIT imm	A AND M	76.Z	&89	2	2
Group 4					
STZ zp	M=0	....	&64	2	3
STZ zp,X	M=0	....	&74	2	4
STZ abs	M=0	....	&9C	3	4
STZ abs,X	M=0	....	&9E	3	5
Group 5					
INC A	A=A+1	N.Z.	&1A	1	2
DEC A	A=A–1	N.Z.	&3A	1	2
Group 6					
PHY	Stk=Y Sp=Sp–1	....	&5A	1	3
PHX	Stk=X Sp=Sp–1	....	&DA	1	3
PLY	Sp=Sp+1 Y=Stk	....	&7A	1	4
PLX	Sp=Sp+1 X=Stk	....	&FA	1	4
Group 7					
JMP (abs,X)	PC=M	....	&7C	3	6
Group 8					
TSB zp	M=A OR M	N.Z.	&04	2	5
TSB abs	M=A OR M	N.Z.	&0C	3	6
TRB zp	M=~A AND M	N.Z.	&14	2	5
TRB abs	M=~A AND M	N.Z.	&1C	3	6

M is the memory location addressed by the operand
X and Y are the 65C02 registers
Sp is the 65C02 stack pointer
Stk is the address &100+Sp
~A means NOT A, ~C means NOT (the carry flag)
NVZC means that flag is affected, . means it isn't
7 means N is set to bit 7 the operand
6 means V is set to bit 6 of the operand

Table I

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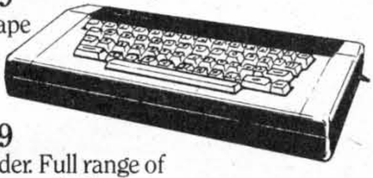

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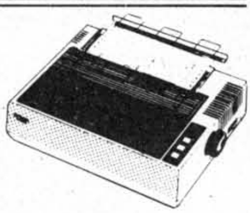

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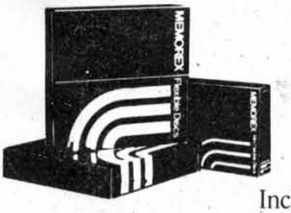

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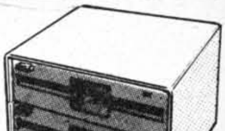

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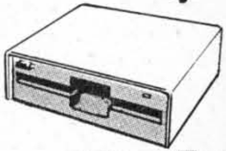

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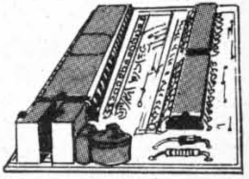

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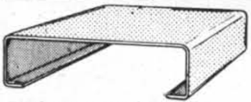

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From Page 64

OSFIND routine is called.

The values were obviously chosen to make it easy to test the required file type using BIT. Similarly ROM-type bytes use bits 6 and 7.

The 65C02 enhancements to BIT provide three new addressing modes which are already available on other instructions. The first two simply add an index to the existing BIT address modes. This could be useful, for example, when checking a table of flags, looking for one with bit 6 and bit 7 set:

```
        65C02
        LDX#&0F    Check 16 entries         .next   DEX        Do next one
.loop   BIT table,X Check current byte              BPL loop   If we haven't
        BPL next   Not this one                                passed zero
        BVS found  Got a byte with Z=1,     .fail   \ Print some kind of "Not
                   V=1                              found" message
                                            .found  \ We come here with X
                                                    pointing at the entry if found.
```

In this example *table* could be either a zero page location, in which case the instruction would take two bytes and four cycles, or an absolute location, taking three bytes and 4/5 cycles.

The last new BIT instruction, BIT immediate, has the operand following the opcode. A typical use would be to set the sign or overflow flags without altering any of the registers. For example, BIT#&C0 would set both the flags, and BIT#&40 would set just the overflow flag. The ANDing action to set the zero flag still takes place, of course.

Unfortunately there is a bug in the 65SC02 – the BIT immediate instruction does not set the sign or overflow flags correctly. Its use in this way should therefore be avoided.

Group 4

The store zero instructions are very useful. They set the contents of their operand address to zero. An alternative mnemonic is CLR, which is the one used for a similar instruction on the Motorola 6800.

The zero page and absolute versions obviously affect one location. The two sequences:

```
6502                65C02
LDA#0               STZ total
STA total
```

have similar effects. The 65C02 version has the advantage that it doesn't affect the accumulator or flags, is two bytes shorter and is two cycles quicker.

Similar advantages apply to the indexed versions. These may be used to clear up to 256 locations, with the advantage that the accumulator may be used in the loop for things other than holding the constant zero.

● ***Peter Johnson continues his assessment of the 65C02 instruction set in next month's issue of The Micro User.***

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SCALE is a powerful and totally flexible statement that allows the user to take control of the scaling of the screen. Integers, real numbers and variables can be used.
ROTATE is used to 'rotate' the axes about a point and by an angle both defined by the ROTATE statement on a scaled screen.
CIRCLE and ELLIPSE allow a multitude of shapes to be drawn using a single statement, including:- any regular polygon, circles, arcs, solid sectors, triangles, squares, etc.
FILL is used to 'fill' a previously drawn area, with CFILL setting the colour/pattern/shade within pre-drawn bounds.
TRANS is used to translate the scaled area across the screen by the use of cartesian co-ordinates, subsequent graphics commands making use of the now displaced scaled area.
Plus: SMOVE, SDRAW, SPLOT and UNSCALE.

GENERAL

LLIST can be programmed, unlike LIST, and under the user's control, multiple statement lines can be split up into their component parts allowing for greater ease of reading.
LGOTO is similar to the GOTO statement but more powerful in that it enables the user to jump to 'labelled lines' allowing for neater and more readable programmes.
SORT allows the user to sort all or part of a string array into alphabetical order using single statement. Invaluable for data processing.
SETWIN and WIN allows the user to define, using SETWIN, and display, using WIN up to seven complete windows on the screen. The user being able to select and return to previously de-selected windows at will, the cursor maintaining its last used position within that window.
Plus: OPT, POPFOR, POPGOS, POPREP and ADDCOMM

Compatible with: Acorn DFS,
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Wordwise, Disc Doctor.
Model B, BASIC 1 or 2, OS 1.20

ADDCOMM

Plus: *HELP displays the full syntax of all commands. Price includes a detailed ring-bound User Guide.

Now available for Electron with Rom board

LOGO

LMOVE is used to position the LOGO cursor, usually used prior to further LOGO statements.
ANGLE is used to set the intended direction of the LOGO cursor, the angle being described in degrees.
ADVANCE is used to move the cursor in the direction as set by ANGLE by the distance described in the ADVANCE statement.
TURN gives the cursor a new direction by turning it a certain number of degrees anti-clockwise from its previous direction.
PEN defines the kind of trail left by the LOGO turtle using the internal plot codes.
LCIRCLE and LELLIPSE are the LOGO equivalents of the similar enhanced graphics commands, the shape centre being the current LOGO cursor position.
LPOS is used to return the position of the LOGO cursor from a SCALEd screen.

£28 includes VAT post and packing

TOOLKIT

CHAR is a simplified 'character' designing facility using an enlarged grid that enables the user to quickly and easily construct or alter graphic and pseudo-alphanumeric characters.
COMPACT is used to reduce the size of all or part of an existing program by intelligently appending lines together.
FIND is used to search all or part of a program to find any desired character or set of characters.
GREPL and SREPL are two related commands that enable the user to replace a character or group of characters with any other character or group of characters, under total control of user.
LVAR is used to list all, or alphabetically selected, variable names currently within memory.
VERIFY is a simple command to confirm that a copy to tape or disc is exactly the same as the original program in memory.
Plus: MEM, GOODPROG, KILLREM and FKEYS.

These commands are unlike those on any other ROM, since they are used in exactly the same way as the standard BASIC commands:- i.e. any numeric/string expression, multi-line statements, access to any variable, and of course, no stars!

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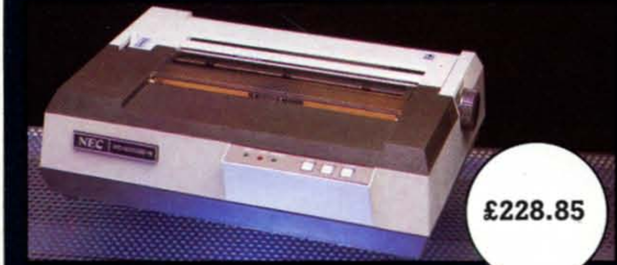

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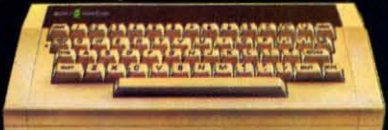

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Classroom Corner

A valuable maths exercise by **PALI RAO**

Sign of the times (and addition, subtraction and division)

IN Number Signs a child is tested on simple subtraction, addition, multiplication and division.

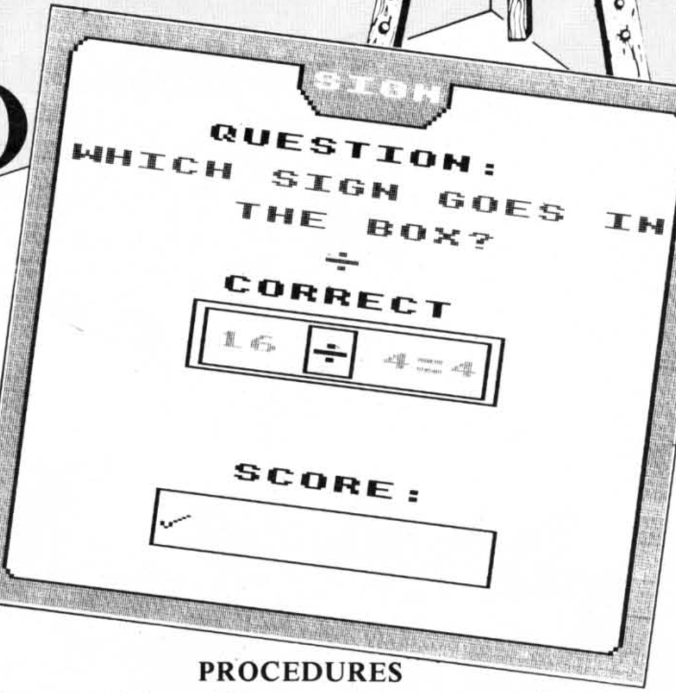
The program prints a sum with a box in place of the correct sign and then the child is asked to enter the correct symbol. If the child is wrong, the computer will tell him or her and also give the correct symbol.

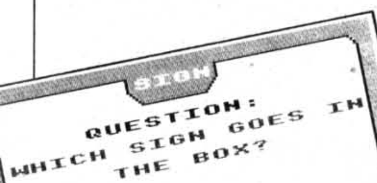
If the question is answered correctly the score is incremented by one, adding up to a total out of 10.

The program uses the normal computer symbols *, /, –, + for the mathematical functions, even where this requires the use of the Shift key.

However if the child fails to use Shift, the program will prompt accordingly.

The program uses Modes 7 and 2 and also involves the speech synthesiser when entering the name. But if you haven't got such a modification the program will still run normally.


```
SIGN
QUESTION:
WHICH SIGN GOES IN
THE BOX?
÷
CORRECT
16 ÷ 4=4
SCORE:
✓
```


```
SIGN
QUESTION:
WHICH SIGN GOES IN
THE BOX?
7 ☐ 2=9
SCORE:
✓✓✗
```

PROCEDURES

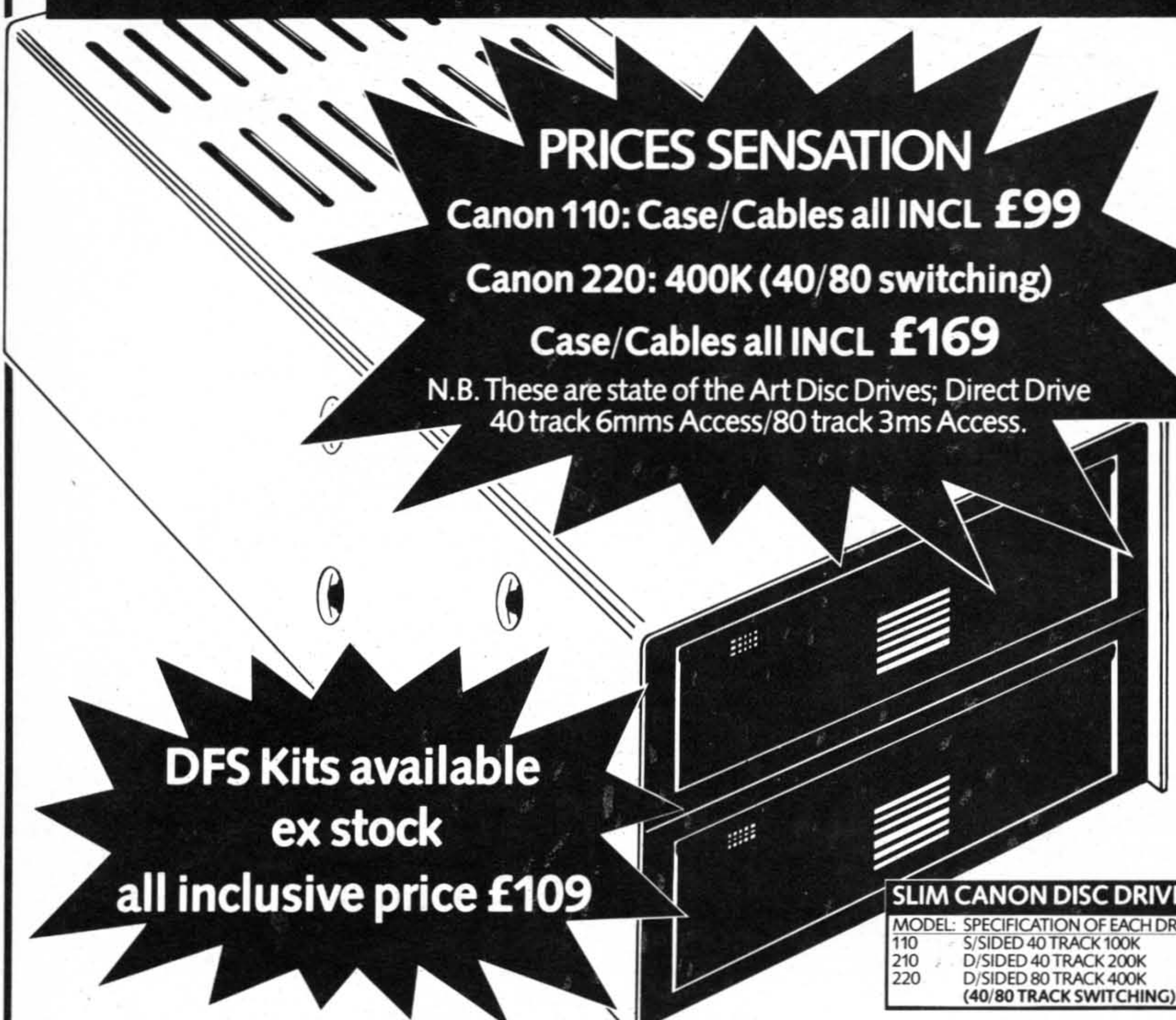
PROCinit	Initialises variables and also sets up the user defined characters.
PROCinstr	Prints out the instructions and explains the keys to be used.
PROCtune	Plays a short tune and then causes a delay while the tune is being played.
PROCname	This procedure from *The Micro User* asks the user for his/her name. The speech synthesiser also asks the user but this will not have any effect if not fitted.
PROCcalc	Calculates the values for the equation.
PROCscreen	Sets up the screen, draws a border and box.
PROCbox	Draws the box in place of the numeric symbol.
PROCmessage	Informs the user whether the symbol was correctly input or not and also prints out the correct symbol if necessary.
PROCscore	Tells the user the score obtained and gives an encouraging message depending on the score. This procedure also asks the user if the game is to be played again.

VARIABLES

TE$	Name of the player.
X%,Y%	Position of sum on screen.
SX,SY	Position of tick/cross.
BX,BY	Position of box on screen.
delay	Delay period for PROCdelay (a simple loop).
SC	User's score.
A,B	Random elements in the sum.
C	True result of the sum.
A$	Holds user defined symbols for –,+,÷,×

Listing starts on Page 147

CHASE DATA



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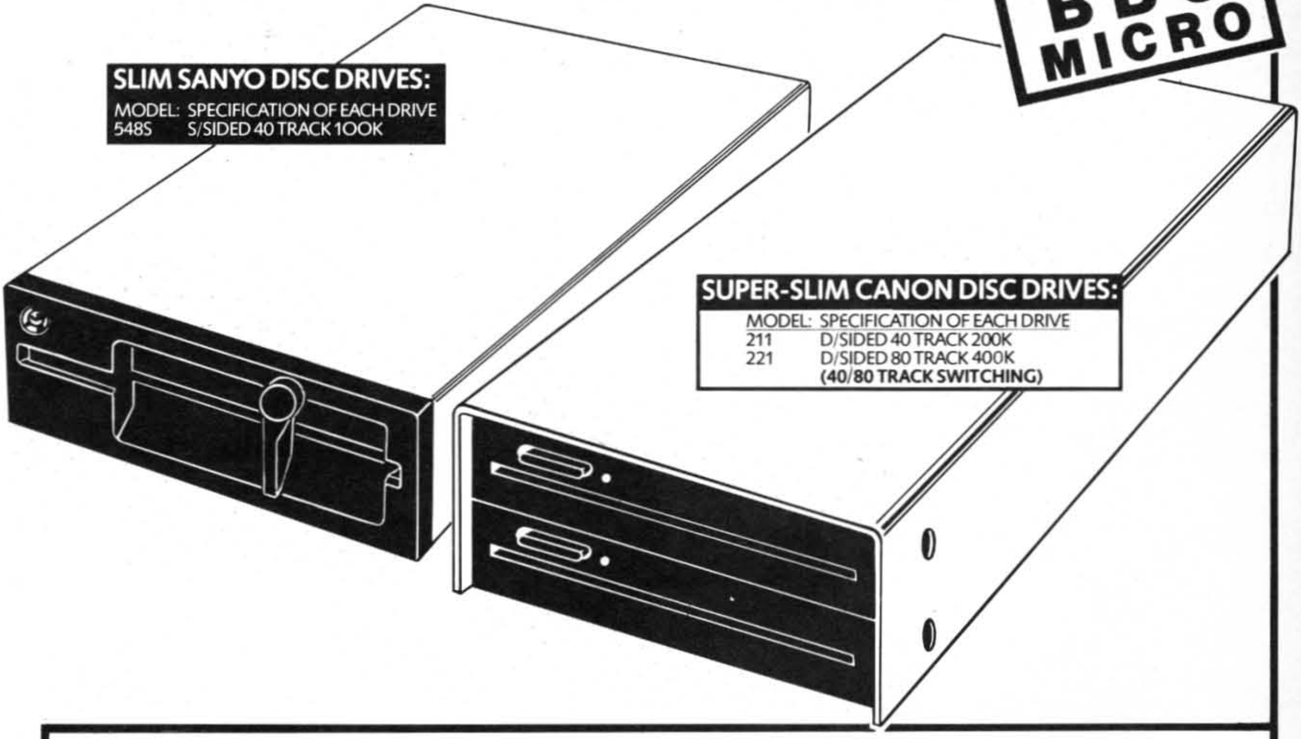

SLIM SANYO DISC DRIVES:

MODEL:	SPECIFICATION OF EACH DRIVE
548S	S/SIDED 40 TRACK 100K

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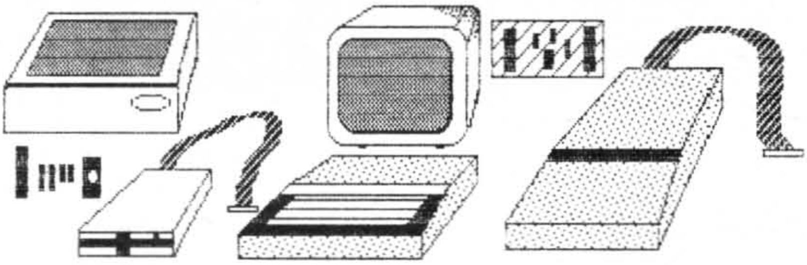

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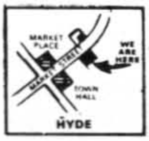

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MIKE COOK'S PROBLEM PAGE

Back issues provide the answers

I HAVE recently purchased the Beeb Body Building Course packs 1 and 2 but I am unable to use them because I do not know how to address the user port.

I have inquired at my local computer shop, but all they seem interested in is selling games. Can you help me? The program I have to write is to turn on LEDs from a switch. – *Richard Mollett, Barkham, Berks.*

● **It sounds as though you haven't got the back issues of *The Micro User* (July and August 1983). The accompanying Body Build articles explained this at length.**

In short, writing to the data direction register will set up each bit on the user port for input or output. To set up bits 0,1,2,3 for outputs and the others for inputs use:

```
?&FE62=&0F
```

Then you can output to the port using:

```
?&FE60=A%
```

Or input using:

```
A%=?&FE60
```

The cost of colour

THE BBC Micro does not provide a colour output from the BNC connector.

However Acorn's reply was to connect a 470pF ceramic capacitor on the underside from the emitter of Q9 between IC45 and the UHF modulator – BC239 to the base of Q7 next to the empty IC97 – BC309.

After trying this, I found that although colour presence was noticed it was far too faint. Is there any way to increase the colour intensity?

I also discovered while examining the circuit diagram of the BBC Micro from the Advanced User Guide that it is also possible to take an audio output from PL16 instead of using the speaker.

Another hint in *The Micro User* was a program for slowing down games – timed delay.

By typing:

```
?&FE45=1: ?&FE46=0
```

I discovered that the whole computer is slowed down. You can watch a mode change, characters being generated – all in glorious slow-motion.

This also shows that during a mode change you can just see two modes, that is changing from 2 to 7 will show disintergration of the video RAM and the appearance of Mode 7.

To revert to normal speed type:

```
?&FE45=11: ?&FE46=14
```

The value contained in these locations can be obtained by **PRINT?&FE45, ?&FE46.** – *Neeraj Sharma, Slough, Berks.*

● **The trouble with this modification is the differing sensitivities of PAL decoders to the botched up colour signal that comes out of any computer.**

To make this colour signal of a commercial TV standard would however double the cost of the computer.

To increase the intensity you could try increasing the size of this capacitor. So long as it is a disc ceramic type then you should have no trouble.

If you have another type why not put it in parallel with the first? This will effectively double the value. What it is doing is to insert the chromanance component of the signal – the higher the value the more signal.

If you inject too much then the picture will be over saturated, but no harm will be done, so feel free to experiment to get the best results.

Videoing a program

I AM trying to make a video of a computer program. Unfortunately I cannot link the output of the computer to the video directly as the frequencies of the input/output of video and modulator are the same.

Is it possible to alter the frequency at which the modulator outputs the UHF signal? The way I am getting round that – by using a video camera on the TV screen – is not very satisfactory, but it was improved by using a switch on the camera which inverted the picture from positive to negative.

Of course there were different colours on the video as a result but the picture was much better. – *S. Taurins, Abergavenny, Gwent.*

● **It is not the frequency of the modulator that is at fault. This can be adjusted slightly by altering the slug accessed through the hole in the modulator box.**

The problem is one of synchronising the computer's video output with that of your picture source.

What you need is known as a Genlock circuit. This alters the frequency and phase of your computer video to match exactly that of your other video source.

I only know of one source of these commercially for this or any other computer and that is from Video Electronics (tel: 0942 882332). However it will cost you nearly as much as did your computer!

You've got a problem with your micro and you just can't sort it out on your own? Then write to MIKE COOK. If he can't help then probably no one can . .

Is the crimp too thin?

I HAD problems last year with high resistance crimped connectors on three of the seven power supply leads – two of them within the power supply unit.

Since then I have tested nine PSUs, eight of them having potential faulty crimps, revealed by connecting a suitable resistor across each pair of supply wires in turn, to pass 2 amps.

Use a millivolt meter to measure the mV drop between OV on the PSU socket and the resistor end connected to the black wire.

A varying reading will indicate a fault at one of the two crimps at each end of the black wire. Similarly, connect the meter across the +5V socket of the PSU and the resistor end connected to the red wire.

In two cases the wire pulled out of the crimp. My opinion is that the wire is too thin for the size of the connector – which Acorn dispute.

I have also decoupled the

IF you have a technical query for this page, send it to Mike Cook, *The Micro User*, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

Letters on other subjects should be sent, as usual, to Micromail, which this month starts on Page 177.

From Page 75

+5V supply to the modulator which significantly improves the quality of the subsequent display.

In addition I ran a thicker lead from one of the PSU fixing screws and soldered the other end to the modulator case. Lowering the source impedence to the area in question also marginally improves the display fed from the RGB output.

You will also find it revealing to measure the mV drop along each of the leads with the computer powered. – *D.P. Lawrence, Colchester.*

● **Thanks for your advice. I have come across this problem on some of the very early series 2 printed circuit boards but had assumed that Acorn had got that one ironed out.**

Boot up on power up

I HAVE looked at all my issues of *The Micro User* but I cannot find any reference to auto booting on power up.

I wish to use a BBC Micro for continuous monitoring of temperatures and require it to self boot should there be a power failure.

Can you help? – *Tim Fryer, Milton Keynes.*

● **Your answer is on Page 93 of the January 1984 issue of *The Micro User*. Just make link 4 to change the auto boot option from Shift-Break to Break.**

This will give a boot up on power up. (Note that diagram has holes labelled 1 to 8 and it should be 0 to 7.)

Speaking of damage . . .

I HAVE tried through Micronet, Prestel, experts and micro shops, but nobody will give me an answer to my question.

As I order *The Micro User* through my local newsagent, and as I consider it the best micro magazine on the market I thought who else but the expert himself to answer my query?

I own a BBC Model B. If I were to cut the internal wires, disconnect the internal speaker and attach the wires to two small hi-fi speakers to get a better sound, could you please tell me if this would lose any memory or do any damage? And would it affect games programs in any way?

You are my very last hope for an answer. It really is important to me beause the idea of having two speakers on either side of the computer with improved sound, speech synthesiser and games would be very impressive indeed. – *Robert Grant, Gatley, Cheshire.*

● **Yes, you can do this. Wire the speakers in series and you should have no trouble.**

Simple cut is OK

I HAVE just installed a disc upgrade on my Beeb using the directions in your article in the January 1984 *Micro User*.

My computer has an issue II motherboard so I was expecting to have to cut pin 9 on IC 27 etc, but I found that the IC was not soldered in. So I decided to remove it from the socket and bend up the pin.

Then I noticed that the track from S9 didn't seem to go anywhere under the socket, although on the reverse of the PCB pin 9 was joined to pin 7 by a wire.

I have simply cut out the wire and not tried to bend up the pin or cut the track. Do you think this will be OK? And can you tell me what the symptoms would be if not? – *J. Clifford, Bracknell, Berks.*

● **Yes, this should be OK. The symptom of it not being OK is failure of the discs to work at all.**

Teletext . . . or Prestel?

PLEASE could you help me with two questions?

1. I have a teletext adapter with ROM. Is it possible to run an assembly program enabling the ROM to work with a modem, and if so how?

2. I have a View ROM fitted. As I have an Acorn GP100A printer is it possible to convert the printer pad for the Epson printer to allow me to get out of the printer what the manual says, or can you possibly publish a program?

I would be most grateful as I cannot afford to buy an Epson printer. – *R.B. Dingle, Hounslow, Middlesex.*

● **I think you are confusing teletext with Prestel. They are totally different systems having a common display format.**

So the question of running the adapter with a modem does not enter into it. Unless of course you want to send teletext pages to someone else down the phone line.

View requires a printer driver to get all the effects available on a specific printer. These will slowly become available along with a do it yourself customising printer driver.

In the meantime if anyone has written one we would be glad to publish it.

Cool it – with an owl!

AS I experience overheating problems with my BBC Micro – no doubt due to the sideways ROM board – it would appear sensible to improve the micro's ventilation.

Fans or other electro mechanical devices are, in my opinion, undesirable because of their noise.

However, suitably drilled holes in the casing should ease the problem. There appears to be sufficient gaps for the air intake around the tube and 1MHz bus plugs, but the airfow appears to be restricted by the upper casing.

If the upper casing or lid was drilled with sufficient holes the airflow would be improved.

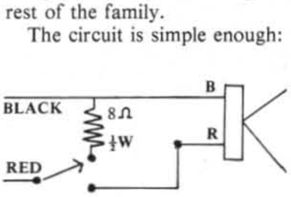
One idea is to drill holes in the form of the owl to maintain the aesthetics of the micro, in the north west corner of the lid.

Before taking this irreversible step I would like your advice on the validity of the theory.

One other idea I would sincerely like to employ is to install a switchable dummy load in the loudspeaker circuit.

This will enable my children to play their noisy games in the living room without irritating the rest of the family.

The circuit is simple enough:

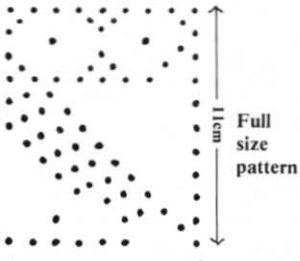


A most suitable position would be underneath the micro in the recess beneath the keyboard and alongside the name "BOOTHROYD". This would prevent the switch being accidentally knocked and gives plenty of room inside the micro for installation. Connectors should be used to enable the keyboard to be removed.

Lastly thank you for the best micro magazine on the market, it never comes out soon enough for me! – *A.P. Randall, Weymouth, Dorset.*

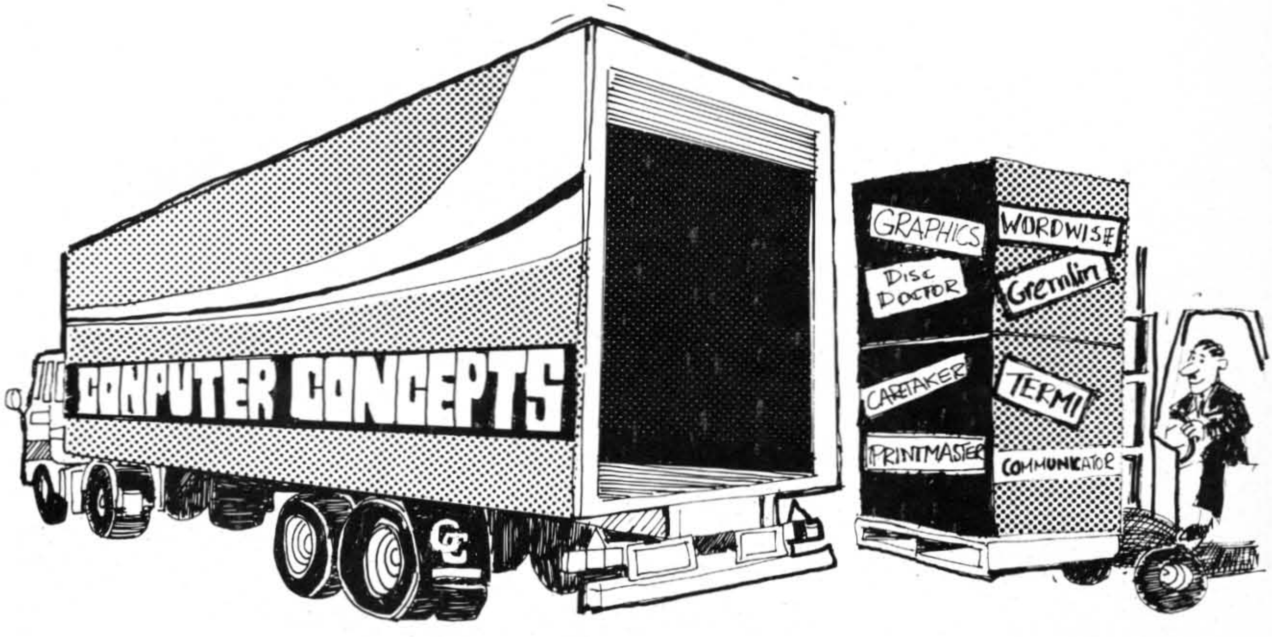
● **Yes, drilling holes in the lid will help to solve your problem of overheating. I think it's a great idea to have the holes in the shape of an owl.**

On the second point there is no need to include the 8ohm resistor – just switch out the loudspeaker. This was one of the first modifications I did on my own computer.



Underside of casing should have a thin loose weaved material or mesh glued to it, to prevent small objects dropping through the holes.

We're on the MOVE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Occult forces are threatening the lives of those near and dear to you. Their only salvation rests in your hands but in accepting the challenge your own existence is put in severe peril.

In taking up the challenge you have to find the TALISMAN and locate a pentagram which then has to be prepared for the final rite. In the mean time dark forces will be opposing you making a difficult task almost impossible.

Do not allow yourself to the lulled into a sense of security for it will be short lived.

Many have gone before only to swell the ranks of the damned.

This is the latest adventure from the stables of Microtest and has been written with the acclaimed features of other adventures in mind eg save facility, quick response, simple but extensive commands, a mixture of logical and fiendish problems to solve.

Be warned this is an easy adventure to get into but devilishly difficult to end.

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Typing '*HELP FONTS' gives a list of available fonts and the blocks of characters which they replace.

Available fonts are:

***Accents**	Accents and miscellaneous.
***Block**	Small capitals.
***Data**	Like the bottoms of cheques.
***Greek**	It's all Greek to me too!
***Joined**	Standard capitals with joined up lower case.
***Maths**	A mix of until now unobtainable Mathematical symbols.
***Miscellaneous**	A few oddities which often are very necessary.
***Thick**	Thick text (for MODEs 0&3) to enhance 80 column mode.
***Thin**	Thin text (for MODEs 2&5) which makes modes 2 & 5 much more readable or perhaps "READABLE".
***Vertical**	For labelling graphs.
***MODE 8**	Ten column multicolour, memory-miserly mode.
***S DUMP**	A dump facility which will produce a screen dump of any MODE from 0 to 8 (including a text only dump in MODE 7) on an Epson, Star, CTI CP80 or MT80.

The ROM uses absolutely NO user memory and can be used with word processors etc. as well as normal BASIC programs. The DUMP utility will produce positive or negative graphics and will also rotate the picture produced through 90° as well as being able to position the picture anywhere laterally across the sheet of paper.

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Now available the Starstick ROM and Joystick. This comes in three forms:

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This enables you to plug the Rapid action self centring joysticks until now only available for the Spectrum/Atari/CBM machines into the user port of the BBC. Model A users please note NO ANALOGUE INTERFACE REQUIRED.

Disc Users Note – pressing BREAK, SHIFT-BREAK or CONTROL BREAK does not modify or destroy the STARSTICK software so Disc Users please feel free to Boot!

The software patch provided in the ROM is interrupt driven and adds the following commands to your computer.

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- ★ STICK turn on the STARSTICK ROM
- ★ NSTICK turn off the STARSTICK ROM
- ★ SETSTICK set up joystick to users spec
- ★ SAVE "NAME" 140 160 saves your user-key protocols
- ★ ADVAL emulate standard analogue joysticks
- ★ PAUSE define key to Freeze game
- ★ NPAUSE turn off ability to freeze game
- ★ "NAME" predefined key protocols set up for software houses programs
- ★ HELP KEYS displays currently selected key protocols
- ★ REPEAT enables auto-repeat fire
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Large picture shows BBC Computer System and a Quickshot II Joystick. Small inset just a few of the joysticks that will work with the patch lead. Screenshot by kind permission of SUPERIOR SOFTWARE

All MICROTEST ROMs are fully TUBE® compatible. (TUBE ® is a reg. trademark of Acorn Computers).

ANOTHER GREAT FREE COMPETITION

Go Forth and Multitask!

Skywave SOFTWARE
MULTI-FORTH 83
for BBC Micro ©

THIS month we're giving away three of Skywave Software's Multi-Forth 83 ROMs – the latest language ROM for the BBC Micro.

Forth is the ideal language for the BBC Micro programmer who's looking for "something completely different".

Incredibly fast and powerful, Forth is not only easy to use, but it also guides you to structure your programs naturally. In fact you have no choice.

Also Forth allows you to define your own words. This means you can tailor the language to your own requirements by creating words to cover such things as plotting circles and so on.

In addition Multi-Forth has many features that make it the most advanced Forth available for the BBC Micro. Not only is it the latest version of Forth – the Forth-83 FIG standard – but it also supports multi-tasking.

This means you have several completely independent programs running on the same micro at the same time – up to 28 at once!

So, for example, you could have your micro listing one program while you're working on another – or you could be receiving messages via your modem while still using your word processor program.

As you can see, the potential is enormous, so why don't you try to win one for yourself?

The competition must be the simplest ever. You must have read Bob's letters to Trev in Micromail – all you have to do is to send us Trev's postcard to Bob. The funniest ones win – provided they're printable!

JUNE CONTEST WINNER

WINNER of our June contest was Geoff Eisenhauer of Ipswich, who receives a 6502 second processor for his efforts. The winning entry was:

IN the beginning there was REPEAT. And the Lord Acorn said unto the first programmer: "As oft as ye shall use REPEAT so shall ye use UNTIL.

In this way ye shall go through any section of program as oft as ye shall choose.

On the first pass thy "counter" shall be known as one and on all other passes shall thy counter be known as "counter+1".

In this way shalt thou know how many times thou hast been through thy process.

But beware of the forbidden GOTO within thy REPEAT ... UNTIL loops. For, if ye shall eat of this forbidden command in thy loop, verily, ye shall be lost within the maze of eternal repetition. And on thy belly shalt thou go for the rest of thy PROCs.

And the fruit of the knowledge which cometh from the second processor shall be denied thee".

```
   10 REPEAT
   20 counter=0
   30 REPEAT
   40 counter=counter+1
   50 COLOUR counter
   60 PRINT TAB(6,16)"COLOUR ";counte
r;" "
   70 time=TIME
   80 REPEAT UNTIL TIME=time+100
   90 UNTIL counter=15
  100 UNTIL FALSE
```

POST CARD

Dear Bob

Trev

Name

Address

Enter Trev's message to Bob on the left of the postcard (no more than 200 words), fill in your name and address in the space provided on the right, then send this coupon to: Forth Contest, Micro User, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

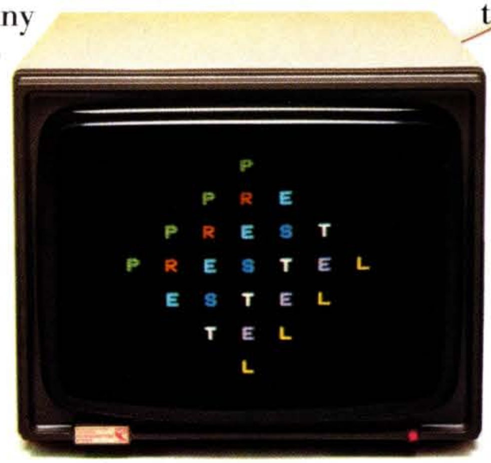
Hey Prestel. A new dimension for the BBC Micro.

Add the new Prestel Adaptor to a BBC Micro and you can download all programs available on the Prestel service.

Which considering Prestel is fast becoming a major software source, is a very attractive proposition indeed.

You can, for example, connect it to the growing Micronet 800 database. This gives you an extensive choice of educational and business programs. Other 'closed areas' for private company communications are also available.

And that's in addition to games that range from simple to sophisticated. Plus electronic shopping and banking facilities, and an extremely useful personal 'mailbox' service.



But that's only the beginning. The Adaptor also enables you to access Prestel information on any TV or monitor. And store the data so that it can be displayed or manipulated how and when you require it.

What's more, the Prestel Adaptor turns your BBC Micro into a terminal that can link with other dial-up computers with 1200/75 baud interface.

So you can, for example, have access to the British Telecom Gold electronic mail and telex service.

In fact, the enormous potential of our Prestel Adaptor, coupled with a surprisingly modest price of £99 + VAT, make it a most exciting not to mention economical way to get more from your Micro.

The BBC Prestel Adaptor is currently only available via mail order.

You can order it on your credit card by ringing 01-200 0200 at any time, or 0933-79300 during office hours.

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For use with any BBC Micro 'B' with 1.2 MOS or later issue.

Prestel Language ROM supplied.

Dealer will install ROM together with MOS update if required in the BBC Micro.

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A BT socket outlet of the latest type will be required.

Connection via RS423 serial port.

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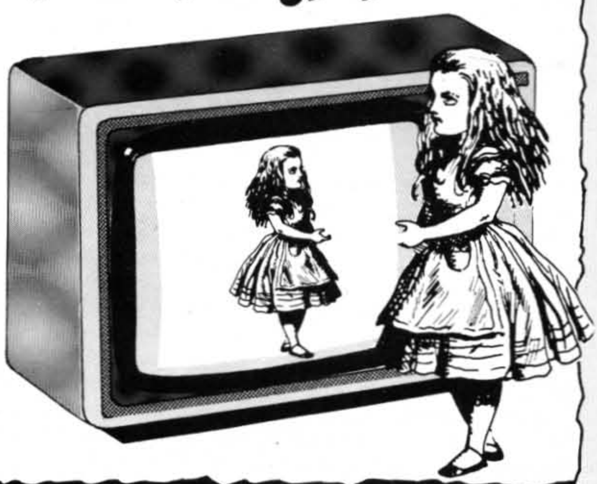


Our monthly foray into Adventure games

Space venture to the music of the spheres

ONE of the favourite settings for an adventure is a deserted spaceship. I can only think of one book which begins in similar fashion – namely "Tiger Tiger" by Alfred Bester.

It's an interesting story because not only does the hero have to escape from the wrecked and empty spaceship but he also has to rediscover his ability to jaunt – that is, to travel through space by thought alone.

To achieve this he has to locate a number of objects and people, whom he interrogates telepathically, travel through a maze called the Gouffre Martel, open a safe and eventually distribute around the world an incredibly powerful substance which caused the original Big Bang and can be exploded by anyone just thinking about it.

The moral that we are all responsible for, and in the front line of, a nuclear war was made quite clear.

Unfortunately adventures are nowhere near this thought-provoking level, partly because the complexity is beyond the modern micro and programmer and partly because originality is rarely profitable.

Consequently space adventures almost always feature a cryptic computer, lifts that don't work, doors that won't open, engines and generators to be mended and shuttles to be flown, plus the occasional space suit to locate.

Robots are almost constantly on the prowl and the dilithium crystals can only be mined at the end of an underground maze – tough luck if you forgot the spade or the gadget to fix the drill.

The Five Spheres of Goliath by Kansas is the fifth deserted spaceship I have encountered. The main difference is that this one has sound – you get Melvyn Bragg's theme tune by Paganini as your predicament unscrolls.

The first problem is to escape from your cell. This is *quite* a problem because, although you know the ship is at rest – Einstein steps back in amazement – I had to search the cell before I could find the bed and mattress I had just been sleeping on and then I couldn't climb on it or go up.

The next problem was to repair the generator accompanied by a nice sound effect that fades as you move away.

I stood there admiring my handiwork. It would have been a neat trap to have the sound deafen me had I stayed too long, but, as usual, I knew I was safe because I had taken the hint that "There are more things in heaven and earth, Horatio" and (look it up) "if we list", followed by GOTO 140, the program can be read and restarted. Actually I needed this because the SAVE wouldn't work.

Apart from the generator I found the lift and car sound effects a bit tiresome. I hate waiting, and there is a deal of going to and fro to get the coins to get the balls to get the wire to open the safe, and so on.

You have 500 moves to save the ship. I didn't manage it first time – the cryptic clue "Put the E between 1 and 3" baffled me.

Note that it does add more interest to have a move or time limit, and I eventually finished in 245 moves (PRINT T1%). I'm fairly sure that can't be beaten.

You can phone Kansas for help "when you get completely thwarted – and you will". It surprises me that people write in asking me to help when almost every manufacturer is delighted to answer questions – it gives them an idea of their market.

Incidentally, Level 9 now issues hint sheets which I can thoroughly recommend. They contain hundreds of clues cleverly mixed up and you can actually play the games in reverse – that is, reconstruct the game without buying the program!

In Startrek by Superior Software you are on the bridge of the starship Enterprise. North is the radio (Uhuruless), south is the helm (Sululess) and west is the science computer (Spockless, but with button).

As usual everyone's left you and nothing is working, so go east into the lift which is dark and has a slippery floor. Some zealous midshipman has holystoned it into a death trap (until you get the lights on?). Make a note in the log to have him keelhauled.

You have a choice of five levels – Armoury, Transporter, Exobiology,

From Page 81

Engines (Scotty couldn't take it any more so he's gone, too) and Hanger, where there is a working shuttle.

Your mission is to get the dilithium crystals, new sensors and navigational computer and rescue Spock (surely they mean Kirk) from the Klingon ship just off the port bow. He's in room 84 – the Klingon brig.

To help you further the crystals are in room 63, the sensors go on the hull of the Enterprise – room 89 – and you have to steal the Klingon's computer from room 86.

There are two ways out of the ship – the transporter and the shuttle – one of which takes you to a flat plain (never seen a hilly one), which needs excavating, leading through a forest maze to a mountain which you can only climb if you have the right gear. Then you have to break into a maze of tunnels and off to work you go.

There are 101 rooms, the last of which does not contain the worst thing in the world. All in all a nicely thought out, logical game for Star Trek fans.

Having said something nice about a Superior Software game I'm afraid I must criticise their Lost City – it's by different authors and downright dull to play.

I have seen a good review of it that couldn't even get past the *first* problem – how to get out of the valley (WEAR BOOTS, CLIMB MOUNTAIN).

There are about 40 rooms – I worked that out from how the program scores – and it's quite tricky to see how you move between them.

Built into the room descriptions are the key words to get you to the next room.

You have to say OPERATE DRILL or you're stuck by a rockfall and EXCAVATE SPADE – what's wrong with USE and DIG?

Also the password appears to be randomly chosen from six words and the clue is the "cryptic words REMEMBER THE ICE" which is not cryptic.

So much for games I can solve but, even with MZAP, the machine code adventures make life difficult. Bob Redrup has been very helpful with Twin Kingdom Valley, having progressed to almost 900 points. He sent me a neat map laid out as described in my Hobbit article and "The Guide to Playing the Hobbit".

The sick giant is the answer to a lot of problems – free him, give him something, then move and wait. Most of the time he will follow you.

Lead him to Watersmeet, which cures both of you if you are weak. He can now help you to carry things but he is a bit greedy and tends to grab anything in sight.

With his help you can eventually enter the Large Hollow Chamber and reach the River of Gold and the Secret of Life.

I was stuck in the Wheel of Fortune so I wrote to Epic and got my legs smacked for being stupid. Surely I "should realise that a penny is worth more than an old boot", but I climb mountains in old boots and a penny ain't what it used to be.

I am currently rummaging at the bottom of the well (there's a ladder in the hut) but I'm not very intrigued by 250 rooms, most of which are "on a road", "by a well", "by a hut", etc, and the Mode 7 pictures aren't much help.

Nevertheless Epic has put a lot into this game and kids should enjoy it because it's random, freewheeling and illogical.

All my adventures are totally logical, so now for the solution to the Trap Door Maze in the May issue of *Micro User*. I called it that because it is not certain that you can return immediately to a room that you have just left.

Nevertheless the odds of never being able to return to Room 0 are about 1 in 10. This room does connect to all the others, so the game is solvable in practice.

Most people had no trouble with the first part – you GET all the objects and then leave a trail (AXE, BOTTLE, CORK, DAGGER, EGG, FEATHER, GUN, HELMET, ICON) at each new (empty) room. You then GET JEWEL, tumble randomly back to Room 0, collect all the other objects and drop them in Room 0.

Everything disappears and the maze reconfigures, but now you can use SCORE (try it) to find your way to the money. Note that every time you TAKE the $1,000,000 the maze will reconfigure and you are dumped back in Room 0. Nobody realised that you can use the money as a marker – just once.

Drop the money in Room 0 – which can always be reached by random moves and is now identified – and so for the long haul.

Imagine how easy the maze would be if you were ever told what exits were available as you enter a room. You have to work this out for yourself by careful choice and cautious move.

This steady, logical mapping requires clear thinking and patience to eventually get to the EXIT, take it, tumble back to Room 0, get the money and win.

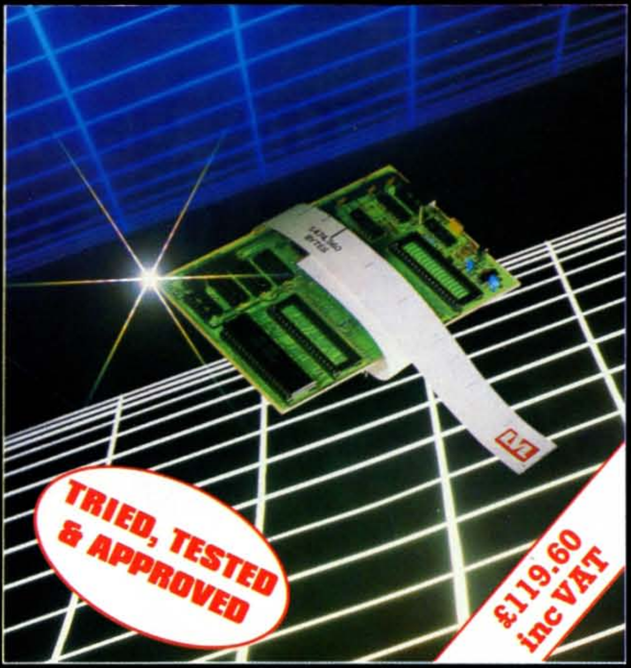
Nobody worked out the final twist, but the nearest was S. Chmiel who, encouraged by our excellent prize, sent in a two-page explanation. If he can open the MOD2HEX safe he'll have to change his name.

This month's totally logical game has you in charge of the Filthy Fifteen – the toughest, most unsociable bunch of prisoners ever jailed. They can't stand each other for more than a night.

You have five cells and all you have to do is keep them happy for a week to win promotion. I'm looking for how you work out a solution rather than just an answer to this schoolgirl problem. **Alice**

```
   10 REM THE FILTHY FIFTEEN
   20 DIM P(15,15),N(15)
   30 FOR I= 1 TO 15
   40   N(I)=1
   50   FOR J=1 TO 15
   60     P(I,J)=0
   70   NEXT J
   80 NEXTI
   90 FOR night= 1 TO 7
  100  PRINT"NIGHT ";night
  110  FOR cell = 1 TO 5
  120    PRINT"CELL ";cell
  130    INPUT "The 3 prisoners are "
,X,Y,Z
  140    IF X=Y OR X=Z OR Y=Z THEN PR
INT"DON'T CHEAT":GOTO 120
  150    IF N(X)=night AND N(Y)=night
 AND N(Z)= night THEN 170
  160    PRINT"PRISONER ALREADY LOCKE
D UP":GOTO120
  170    IF P(X,Y)+P(X,Z)+P(Y,Z)=0 TH
EN 190
  180    PRINT"PRISONERS REFUSE TO SH
ARE A CELL AGAIN":GOTO120
  190    N=night+1:N(X)=N:N(Y)=N:N(Z)
=N
  200    P(X,Y)=1:P(X,Z)=1:P(Y,X)=1:P
(Z,X)=1:P(Z,Y)=1
  210  NEXT cell
  220  PRINT"DAY BREAKS AND NO RIOT S
O FAR"
  230 NEXT night
  240 PRINT"WELL DONE YOU ARE PROMOTE
D GOVERNOR":STOP
```

DOUBLE MEASURE...



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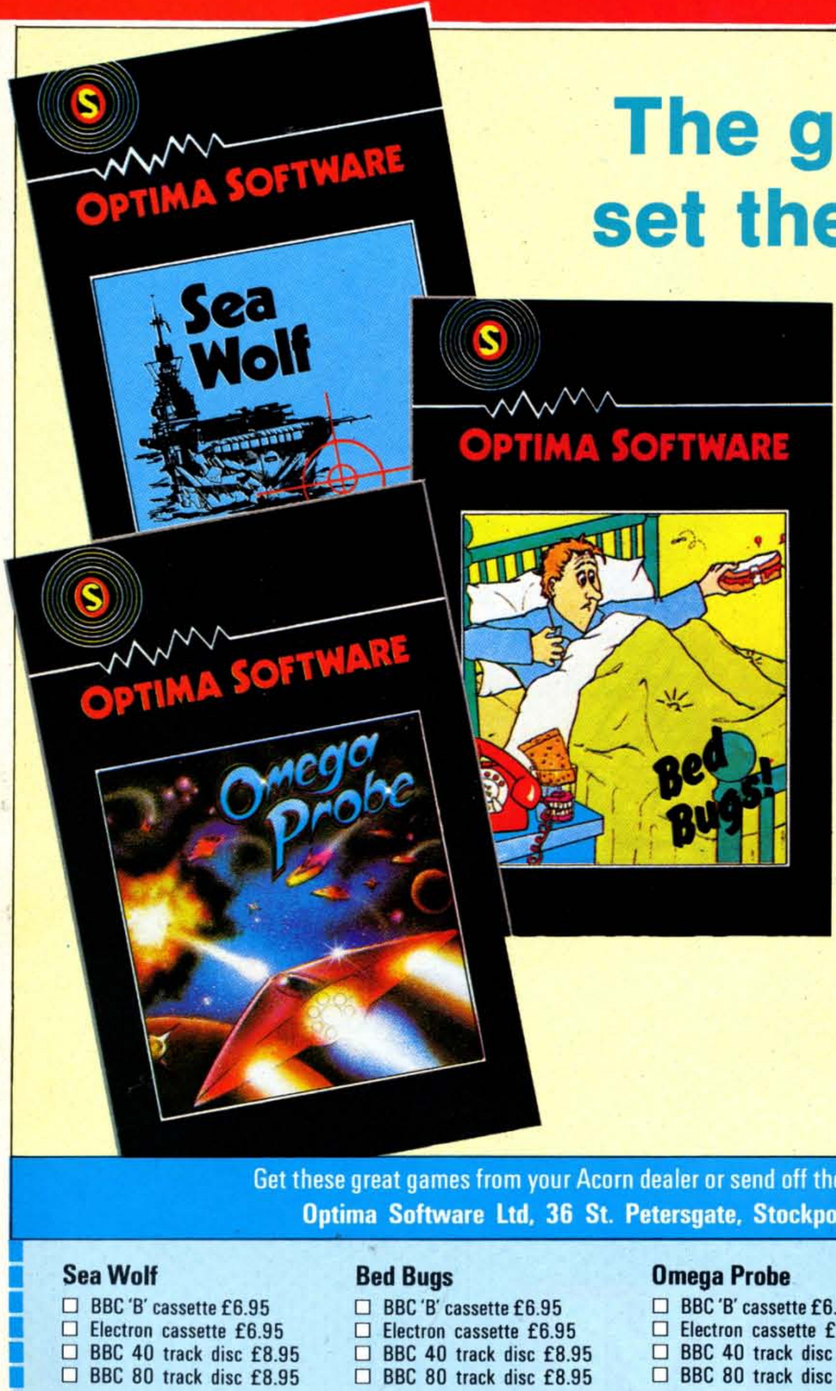
OPTIMA SOFTWARE



The games that set the standard

SEA WOLF

So far all has gone well. You have successfully guided your submarine safely through enemy controlled waters and you are beginning to relax.

Suddenly alarm bells scream in your ears – you are under attack!

Desperately you scan the radar screen. Should you try to get him within range of your torpedoes, or attempt evasive tactics? Can you lead your crew to safety?

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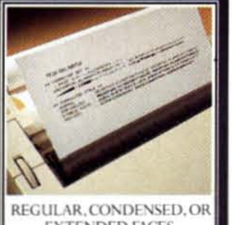

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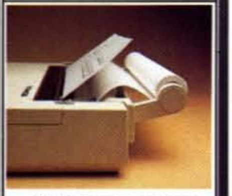

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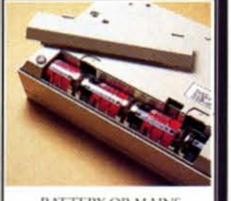

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Quietly efficient, it delivers high definition dot matrix text over 80 columns at 30 characters per second (maximum).

The HR-5 also has something of an artistic bent.

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Life was quiet, until the mutant lobsters...

THE year is 2005, Earth has been devastated by a nuclear holocaust and the few remaining members of the human race have been forced back into an old way of life as cavemen.

Life was quiet until the mutant lobsters turned up.

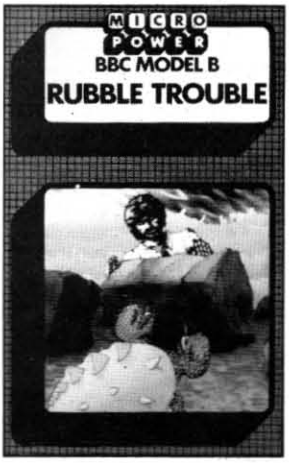
In **Rubble Trouble,** you pit your wits and strength against ever increasing numbers of these flesh eating lobsters known as Krackats.

When the game begins you are in a maze of boulders which you can roll about to crush the crustaceans.

You may be thinking that this is just another Pengo type game, and you would be right. But there is one very clever variation.

Should you push a boulder towards a Krackat and miss it you had better be nimble, because these boulders bounce!

On many occasions an itchy trigger finger left me chewing rubble and watching another little caveman, complete with halo, floating upwards to that great gravel pit in the sky.



One by one the rocks disintegrate. This, along with the increasing level of radiation, provides the game with a time limit, bonus points being awarded for a quick clearance.

The boulders come in three types. The first are common or garden rocks. The second blue in colour, are worth 150 bonus points when crushed. Finally come the flashers, to be avoided at all costs as any attempt to roll or crush one results in a nuclear explosion.

Should you tire of this maze there are two further options. First there is the hayfield in which the maze paths are filled with illusionary boulders which can be walked through without the need to crush them, leaving a clear path behind.

By disguising the maze layout in such a way, rolling boulders and escaping Krackats can be a very risky business.

Finally comes the invisible maze, where the rocks are invisible except when rolling. Not for the novice.

Excellent graphics and good use of sound combined with a well inplemented twist of an established theme kept me at the computer until 2am.

Micro Power has got yet another winner.

Jon Revis

Rescue your loved one

SPOOKS and Spiders is an attractive and incredibly frustrating game.

You have to guide a silly little man through the haunted corridors of a prison to find and release "beautiful" damsels in distress who are being held prisoners behind one of the many cell doors.

To rescue his sweetheart, a key must be obtained to open the cell in which she patiently awaits her knight in shining armour.

This key is to be found hanging next to a door. To reach it a series of obstacles must be passed. For instance, giant spiders and irritating ghosts prowl the corridors acting as guards.

They can be avoided by a well aimed leap which is easier said than done. An accurate jump will clear them but experience is a must if you want to complete the first of the three stages.

Spooks & Spiders
INVASION
the BBC Micro Model B

If you are lucky enough – sorry, skilful enough – to gain possession of the key, great care must be taken not to bump into walls, ghosts or spiders for you will drop your key and use up one of your three valuable lives.

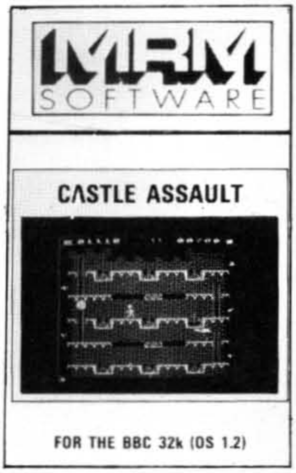
A series of ladders takes you to different levels in the prison.

Once you have successfully opened all doors and rescued your loved one, you will jump for joy and pass onto the next phase – which seems more impossible than ever. The ghosts will become skulls and the whole game gradually turns you into a nervous wreck.

This is a difficult, but very enjoyable game which becomes compulsive since you always think that such a low score as your last can easily be beaten.

The skilful selection of colours and graphical displays used by Software Invasion make the game very presentable. My only criticism is that a wider range of sound could have been used to make it more entertaining and lively, although the sounds used are acceptable.

Mark Freeman



Low price – but still a challenge to the ace

CASTLE Assault is the first MRM game I have played, MRM being a fairly new name in software for the BBC Micro.

Anybody who has seen their advert for software at £5.70 must, like me, have thought the price was a reflection of the quality.

However as soon as the tape had loaded I was proved wrong.

The game description was well presented and the instructions equally simple. After tapping the spacebar I was playing.

The screen layout was a castle split vertically into layers. I was a figure standing on the bottom level of the five.

Three of the levels were the same, consisting of three smiling crabs sitting in sunken boxes, each crab jumping in succession. The other two levels had a moving walkway as their obstacle.

Firstly the crabs have to be leapt while they're not leaping and bonus fruit can be collected from the ladder end of the first four levels.

After eventually passing the crabs, you face the moving walkway which is even more

→

From Page 87

difficult. You have to jump on, run along, then jump off the platform as it oscillates from side to side.

I persevered, and eventually made it to the gold on the top level and so graduated to the next stage.

Stage two has the same basic layout – a change would have been nice – but the crabs are replaced by coiled snakes, boulders fall from the ramparts and a duck sometimes seen on stage one flies around, causing havoc if met on the same level.

In the unlikely event of reaching the gold again, a bonus man is awarded, the snakes turn into another leaping beast (there are six in all) and the usual increase in difficulty is encountered.

As you have probably guessed the game is a mixture of Hunchback and Killer Gorilla. The game runs at the same speed as Killer Gorilla, a little slow, and needs a high degree of accuracy in jumping like Hunchback.

The keys are the standard Z X * ? with Return to jump. The sound is very arcade-like but unfortunately the man's steps lacked sound, as did the walkways.

However, the graphics are pleasant with well defined characters and clear movement.

The author has included the usual features including a high score table, a sound on/off during play and a pause facility. The status of the sound and pause is displayed on screen.

One annoying thing is that on hitting Break, in anger or by accident, the memory is cleared and the game has to be reloaded. I have noticed this on other games and I don't approve.

The game is of high quality, and represents excellent value for money. It's fun to play, if a little tricky at first, and needs a technique to be mastered for the crabs and walkways, more prayers for the ducks and boulders.

Personally, I would have preferred the game faster with easier jumps, but I strongly recommend it for the games ace looking for a challenge.

Andrew Smith

Good features, but it's too dear

KEY Definer and **Character Generator** from GSOFT allows you to load from tape or disc a set of function key definitions, and makes it easy to define the user defined characters.

Taking the second first, a 3.2k Basic program presents an 8 by 8 grid of red asterisks. You move around the grid by using the normal cursor movement keys.

Whenever you make a move the asterisk in the new position turns white, showing that the pixel concerned is now "on".

If you want to turn it off you must also press the spacebar.

I would have much preferred the opposite, more conventional method where the current pixel is not turned on unless a separate key is pressed, because in practice you will want more pixels off than on.

If at any time you press the Return key the shape you have designed so far appears on the screen and the eight numbers for the corresponding VDU 23 statement are given.

This allows you to easily design the character, and saves tedious calculation. (See pages 171 and 384 of the User Guide.)

A good feature is that the definition can be saved to tape or disc and reloaded into the BBC Micro's memory, although if you want to include it in a Basic program you must naturally reproduce the VDU 23 statement manually.

All the instructions are on the screen and they are very clear. The program is very easy to use and achieves its objective.

To use the function key definer, simply type *LOAD KEYS. This can be done without affecting any program already in memory.

Pressing key f0 will then allow you to use a printer a bit like a typewriter (mistakes on the screen deleted by the Delete key will be printed), f5 and f6 will give the current value of PAGE and TOP respectively and f9 will

QUICK RUNS

A first look at some of the latest releases

Spitfire: *A flight simulator. Test your skill and concentration as you fly your fighter through a series of realistic and exciting manoeuvres, including take off, landing and looping the loop.* Alligata.

★ ★ ★

Denis Through the Drinking Glass: *In this zany text adventure you take on the role of Denis Thatcher whose aim is to avoid Maggie, overcome all the horrors of the political jungle, and reach the haven of the Gravediggers Arms. You'll meet them all on the way – the Royal Family, Ian Paisley, even the Pope. Every location is described in rhyme.* Applications.

★ ★ ★

Blagger: *As Roger the Dodger, master burglar, you work your way through several buildings searching for golden keys and emptying safes. As you rip off shops, houses and banks be on the alert for many obstacles and spooky nightwatchmen.* Alligata.

★ ★ ★

Neanderthal Man: *In your endeavour to survive in a hostile land full of prehistoric animals, you must feed your family by returning to the cave and throwing food. Use your spear to kill predators as they menace you and your offspring.* Alligata.

★ ★ ★

Contract Bridge: *In this micro-simulation of the real game designed for one player, the computer bids the other three hands and plays your opponents' cards after the first trick. The program includes full instructions in conventional bidding and a running score sheet.* Alligata.

★ ★ ★

Sea Adventure: *You were sailing in the South Seas when your boat was holed by killer whales. You are now adrift in this Mode 7 text and graphic adventure and trying to return safely to England. All movement is made using the function keys for single entry.* Virgin.

★ ★ ★

Brainbox: *In this two player strategy game you must attempt to wipe out your opponent's brain using a laser beam. You direct the beam at him by positioning deflecting prisms according to certain preset rules. Randomly placed prisms interfere with your plans.* Virgin.

★ ★ ★

Web Runner: *Try your skill and reactions as you attempt to escape from an enormous spider's web after planting a bomb in each corner. You will be chased continuously by a motley bunch of flies, spiders and centipedes which you can only eliminate with your laser.* Alligata.

G SOFT
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KEY DEFINER AND CHARACTER GENERATOR
VDU23,255,0,24,60,126,60,36,66,129
FOR THE
BBC MICRO COMPUTER

give the Ascii value of any key pressed.

The rest of the keys will do simple things such as CHAIN or SAVE a program. There is not much value in this part of the package, and it is rather a stocking filler.

Both programs transfer to disc easily and the brief documentation is adequate.

However there are other character definers available which are comparable and much cheaper than £9.95.

Norman Kirkby

Realism is the key!

STOCK Car is yet another new title from the prolific Micro Power software house.

In this game you take on the role of a stock car ace pitting your wits against three computer controlled cars – two in the two player game – as you power your highly tuned machine around a choice of six circuits.

The aim is to achieve the fastest average lap time for any of the circuits, the current records being displayed in the high score table.

Once loaded, the game can be set up to your own requirements by setting the number of players, choice of circuit, number of laps, and finally the degree of skid required.

This last factor is the one which provides the game with its realism. I found that when using a skid factor of 20 per cent the car was a dream to drive – the skid factor is not necessarily a disadvantage. By beginning to turn just before entering a corner the car can be drifted rally style around the bend.

MICRO POWER
BBC MODEL B
STOCK CAR

Great fun can be had by blasting down the outside of the straight in top gear and then cutting across and taking the inside line through the bend, passing some computer controlled dummy who has left you the smallest of gaps. Yet another computer car "bytes" the dust.

Once you think that you've mastered the game, try it with the oil slicks. These appear randomly around the circuit. Once every car has passed them the slicks vanish and reappear somewhere else. Quite often somewhere else just happens to be directly in front of your car.

To say handling is impaired when passing through a slick is a bit of an understatement, you would have more control driving on ice.

Taking a peek at the computer's cars, while grappling with the controls in the middle of an oil slick, I noticed that they appeared to pass through the oil without a waver. I can only assume that they were fitted with tyres of a different rubber compound to mine.

My first impression of the game had been one of disappointment with the graphics – the user's car being the only

→

Frak: *Move Trogg the cave man around by climbing ladders and jumping rocky ledges as you search for golden keys to progress to the next level. Avoid at all costs the flying knives and floating balloons. Various nasties you will meet can be thwarted with your Yo-Yo! Superb graphics.* Aardvark.

★ ★ ★

Caesar the Cat: *Using keyboard or joystick you try to get Caesar to clear the larder of mice by catching them and taking them through the door. As they eat through the larder's contents and flit about on the shelves you must avoid knocking down crockery.* Mirrorsoft.

★ ★ ★

Football Manager: *Take on the role of a football manager as you strive to achieve promotion from Div 4. Using an on screen menu you can swop between buying and selling players, selecting your team, viewing the fixture list or league table, and playing the game. You can even watch graphic edited highlights as the teams battle it out.* Addictive.

★ ★ ★

Manage: *In this interactive management game for two players you make decisions that will influence your opponent's market. Users will learn the significance of pricing policy and the correct allocation of cash resources.* CCS.

★ ★ ★

Mystery of the Java Star: *Four part adventure with each part loading separately. You can only progress to the next part when you are successful in the previous one. The object is to search for a shipwreck and in it find a ruby called the Java Star. The game climaxes in a real time search of the sea bed with restricted air.* Shards.

★ ★ ★

Frac Attack: *An educational package of six games based on the understanding of fractions. Options include Shady Fractions (estimate the proportions of shaded squares), Frac Attack (shoot the wrong answers and rescue the right one), and Hungry Radish (find the biggest fraction or get eaten).* Shards.

Arena 3000: *It's the year 3000 and as a mere humanoid you take on waves of mutants in the entertainment arena. Moving around the screen under key control you fire your death ray in the direction of travel. The mutants only die after being hit several times, but you die from their slightest touch. As you clear each wave a different one arrives to take up the challenge.* Microdeal.

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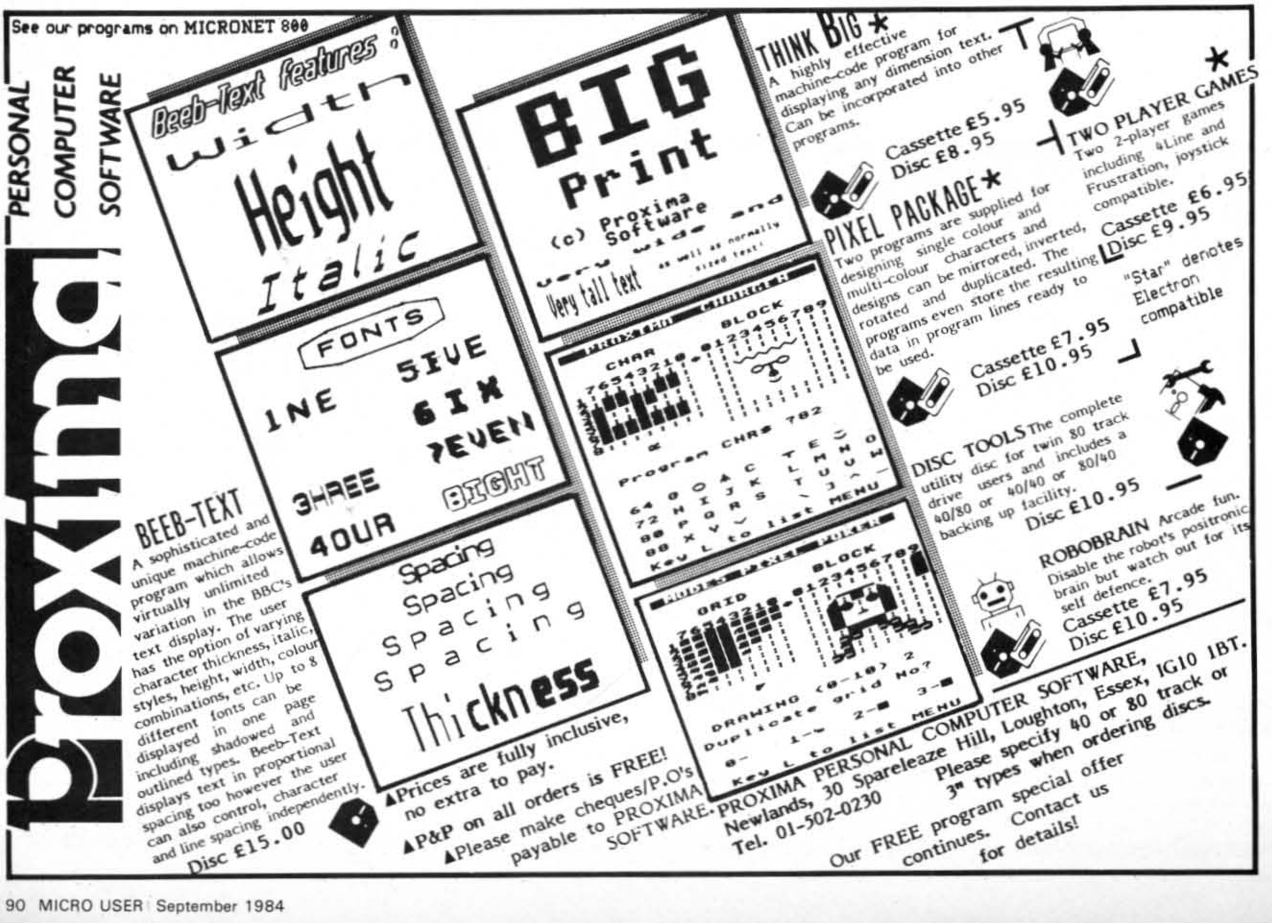

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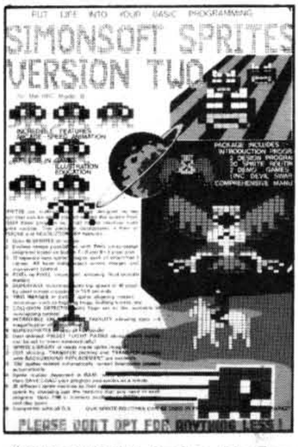
From Page 89

multi-coloured character. But following an hour at the wheel, this no longer seemed of any significance. The beauty of this game lies in the realism of the action.

Jon Revis

One for the 'swarm' fans


PUT LIFE INTO YOUR BASIC PROGRAMMING
SIMONSOFT SPRITES VERSION TWO
PLEASE DON'T OPT FOR ANYTHING LESS!

SIMONSOFT Sprites Version Two came on a disc with 30 entries in the catalogue. This was certainly going to take some time to review! First step was to read the manual, 32 unnumbered pages.

It is immediately apparent that the author hasn't given too much consideration to disc users, as to use any program involves using the downloader provided and a table of PAGE values in the manual. Very messy.

However the two demonstration games included convinced me that if writing "swarm" type games is your bent then this one is for you.

Back to the package proper. The disc (or cassette) contains two sprite definition programs, 20 different sprite control programs (machine code for speed), two demonstration games and some ready defined sprites assembled in "books" that the user can play around with.

The 20 programs give users access to almost any sprite effect they may want, and are packaged separately so that only the code needed for a specific effect is in the computer.

I was quite impressed by a number of features:

- The enlargement facility gives up to ×5 magnification of a sprite. Both base sprites and their clones can be constrained to move along preset paths.
- Transfer plotting plus background storage. The background beneath a sprite is replaced after a sprite moves on. This means some loss of speed but sprites do not change colour when moving over background.

This is quite a nice package with a number of very good facilities for anyone wanting to write programs using lots of motion in Mode 2.

However the manual and/or the loading of the programs could be made a lot clearer for disc users.

Alan Plume

'Pit' your wits against man-eating tomatoes

IMAGINE the scene – your keyboard slowly cooling down from white heat, your joystick wilting from the tension and your monitor reeling from the bombardment of electrons.

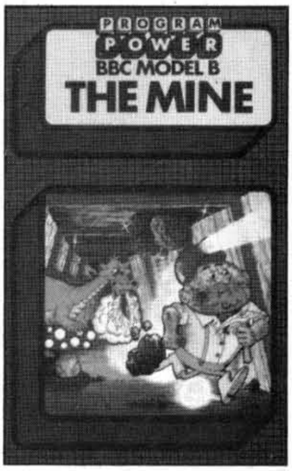
Suddenly you find yourself in a mine, and there's obviously no-one else down there.

You are given your objective – the quest for buried treasure. It is easy enough to get at, so where's the challenge?

Well, I've neglected to tell you about the ferocious tomatoes and the pot-bellied dragon, probably due to all the lighter fluid or equivalent required to breathe fire!

In **The Mine,** you have a side view of the shaft, and you control a particularly 'hunky' character who wanders around it, looking for buried treasure.

The program pits (no pun intended!) its wits against you in the form of giant man-eating tomatoes that rush after you.



The real enemies though are the squat, pot-bellied aardvark look-alikes known as the fire breathing dragons. They run up to you and spew death all over you.

Your only defence against these menaces is the 'neutraliser' which, when activated near the menaces, starts to shrink them until they finally disappear.

However, a more dramatic way of killing is to cause the rocks to fall, smashing down on any menaces in hot pursuit.

This is the best version of the arcade game "Mr. Do" that I've seen, although the market isn't exactly flooded with them.

The quality of the animation and the detail of the graphics is quite superb, especially the mushrooms and the Aardvark clones.

The program includes a hall of fame for the top scores and offers the user a choice of using the keyboard or the joystick to control the character.

The cassette is, as is usual from this company, beautifully packaged with very comprehensive loading instructions including details for disc and Econet users.

The program is recorded twice on one side of the tape. I had no problems loading it.

All things considered, this is a program for small-time games dabblers and arcade addicts alike with many fascinating gimmicks and features.

Philip Tudor

From *je* to *elles*

TENSE French by Sulis Software is an educational package for testing the user on 20 common French verbs, using any of eight grammatical tenses.

The first tape tests present, perfect, imperfect and future, while the second tests past perfect – better known as pluperfect – past historic, conditional and present subjunctive.

The program ran easily from cassette with good instructions. The Mode 5 display menu was clear, each option producing an instantaneous, well laid out display.

The options are: 1, Change of tense; 2, List of verbs; 3, Test on meanings; 4, Test on one verb; 5, Test on all/some verbs; 6, Change volume; 7, Leave the program.

For the test on meanings, there is the full list of 20 verbs on the left, while on the right of the screen in double height letters is: "What is the French for XX?"

The program offers the choice of meanings of English to French or vice-versa.

In the test of all/some verbs, the program takes a verb and a pronoun at random, unlike the test on one verb where it goes in order from *je* to *elles*.

There are, however, one or two quibbles. Apart from the strange terminology of past perfect cited above, it is quite astonishing to see a test on French verbs that includes both the present and the subjunctive, since the latter is usually something only tackled systematically after a few years of basic groundwork, when familiarity with the present would be second nature.

This makes me unsure as to which market Sulis is aiming at.

Also, while immediate reward for right or wrong answers is always a bonus, perhaps they might have taken the chance to test verbs more imaginatively, such as in idioms, or in contexts, which might ultimately prove more useful. **George Hastings**

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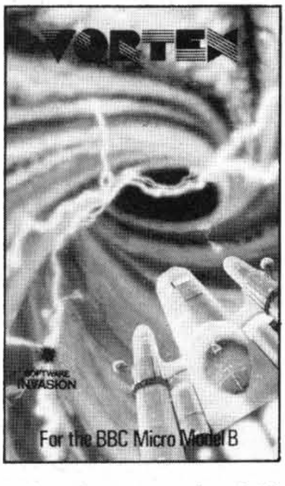
Peril in the 3D Vortex



VORTEX is a Mode 4 three dimensional space game, in which your spacecraft is pulled with increasing speed into a vortex, dodging marauding aliens as you go.

You have the obligatory laser, but the enemy's return fire depletes your protective shields quickly – and they don't often miss!

If you can survive this section, you then weave your way through an asteroid storm with no help from your laser. Should you get through unscathed you face yet more and faster invaders and asteroids.

Death results from a collision or being shot with no shields left, but you do have five ships. Your score depends on how long you survive and how many aliens you shoot.

The 3D effect takes time to get used to, as does the way your ship arcs up the screen as you move left and right. The fire button is auto-repeat so saving keyboard wear – a thoughtful feature.

The game is original, with clear, fast graphics – especially the moving background – complemented by exciting sounds. It is well presented and professionally written and is as good as, if not better than, previous Software Invasion releases.

The on-screen instructions are very clear and concise. The game supports joysticks in addition to keyboard control and there is a sound on/off option.

My only criticism is that all the stages are similar in screen format – they just get faster – and this tends to monotony.

Overall though, nice one, Software Invasion.

Andrew Smith

Only manual lets database down

BETA-BASE is a database program specifically for use with a disc system. Apart from the manual the package is well-designed and could prove very useful.

Many such programs rely on having entire datafiles in main memory when the program is running, restricting the maximum size of files.

This program, from Clares, makes use of the fast access capabilities of disc storage so that files can be held on disc with only a few records at a time in the computer's memory.

This enormously increases the quantity of data that can be handled and the only overall restriction is disc capacity. With about 10 fields per record and about 20 characters per field you could hold about 500 records on a 40 track disc.

The drawback of course, comes in the time taken up by accessing discs.

While it is possible to operate Beta-Base using only one drive, it does involve quite a few swops between the program and data discs. A dual drive system would be much more convenient.

The system offers searches on up to five fields and sorts on up to three. The searches can be performed if wanted by looking for a search string within a field.

This facility is useful where you are uncertain how a piece of data may have been recorded or what it consists of.

The user can enter, view, amend and delete data. Calculations may also be performed on the fields to update them or to report their total.

The data – either all records or those specified by the result of a search – can be printed out in a specified order. The user can choose which fields are to be printed and there is flexibility of layout of the fields on the page.

The redefine option allows the user to add a new field or extend the length of an existing one.

Unfortunately the program is accompanied by an inadequate manual.

Referring, for example, to the transfer-option the manual says it is very powerful, giving the opportunity to transfer the whole or part of a file and to merge it with another file so that new databases can be constructed.

Exciting stuff, but this function was so badly explained that, despite several attempts, I couldn't get it to work.

Ken Garrett

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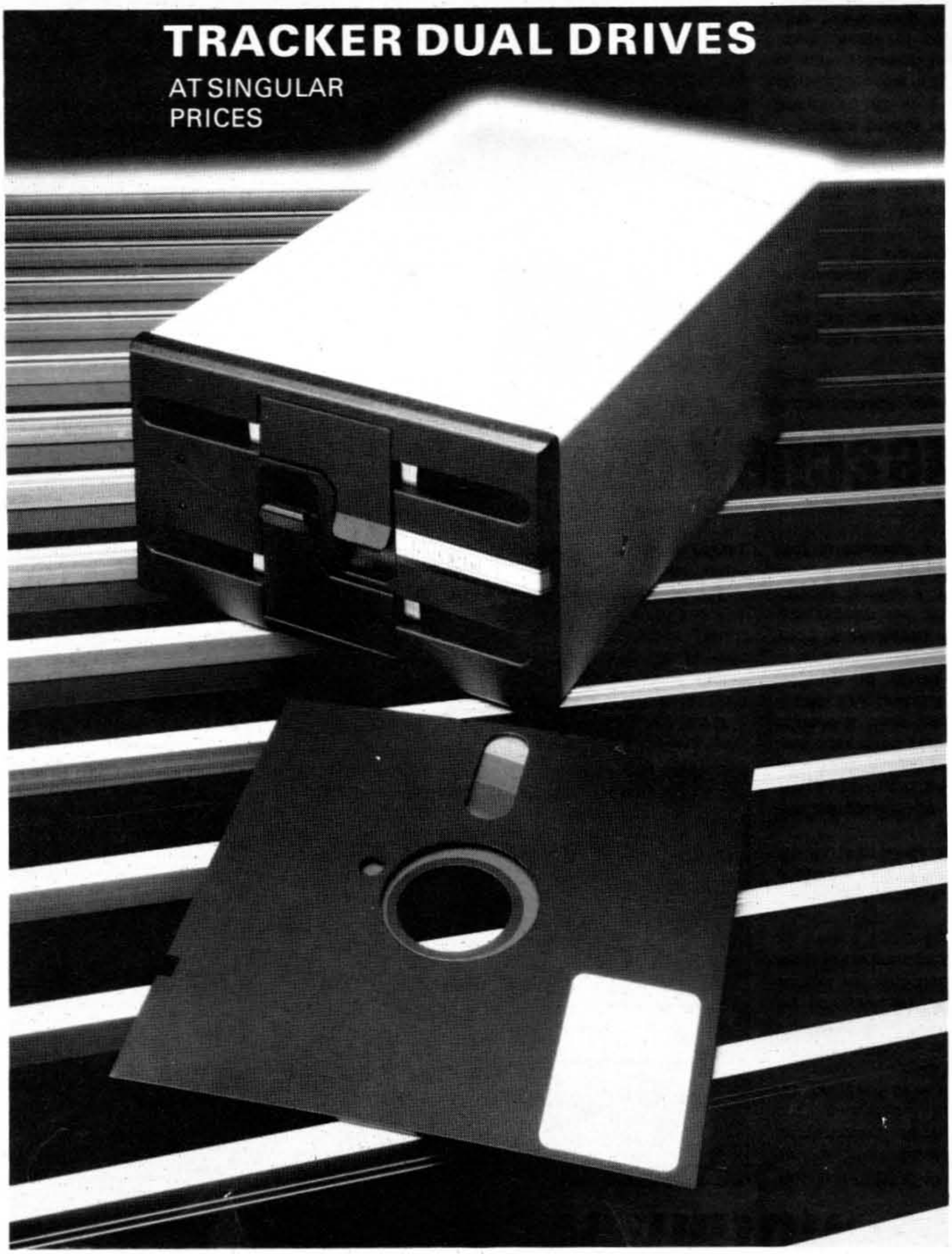

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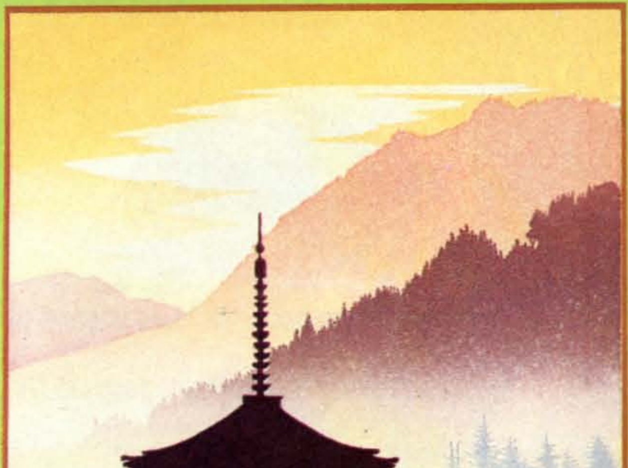

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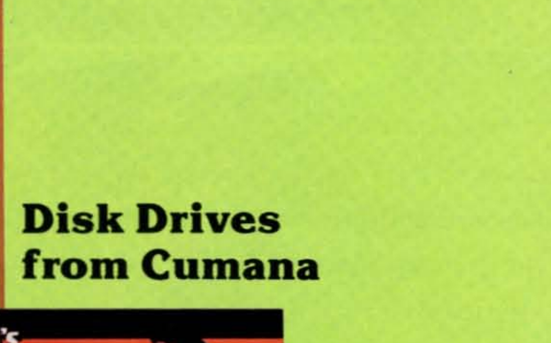
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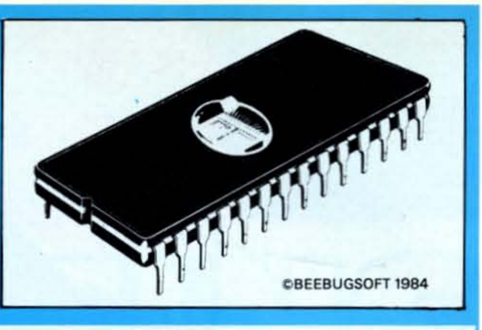
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***MEMORY**	Display memory contents.
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Masterfile

MASTERFILE is a general purpose data base, written especially for the BBC Micro. It is extremely useful, allowing vast amounts of information to be quickly stored.

Once set up, the information may be retrieved or sorted at any time, in a number of different ways, using any of the fields as keys.

Records may be instantly displayed or printed, using any printer suitable for the BBC Micro, also a label printing facility is included.

Separate versions of the program are available for cassette and disc based systems. The disc version uses random access files to maximise record storage.

One extra feature of the disc version is that it provides limited spreadsheet facilities.

Spellcheck

SPELLCHECK is menu driven, and is the ideal companion for WORDWISE or VIEW. It provides an automatic spelling check for letters or documents.

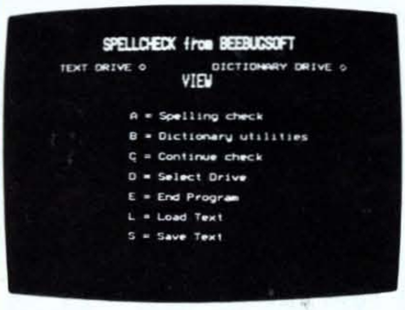
It is supplied with a dictionary disc already containing 6000 words, which may be increased to a maximum of about 17,000 words on a 100k disc.

Random access files ensure very fast word retrieval from the dictionary disc.

SPELLCHECK is menu driven, and is very simple to use, allowing unknown words to be added to the dictionary, ignored or re-spelt.

Incorrectly spelt words may be instantly respelt and a correct version of the document filed away, ready for printing or later use.

Dictionary discs for foreign languages may easily be created to help check letters sent abroad.



```
SPELLCHECK from BEEBUGSOFT
TEXT DRIVE 0          DICTIONARY DRIVE 0
                 VIEW

        A = Spelling check
        B = Dictionary utilities
        C = Continue check
        D = Select Drive
        E = End Program
        L = Load Text
        S = Save Text
```

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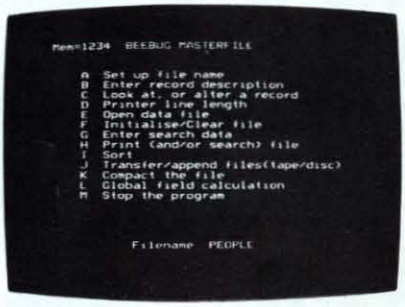

```
Mem=1234   BEEBUG MASTERFILE

     A   Set up file name
     B   Enter record description
     C   Look at, or alter a record
     D   Printer line length
     E   Open data file
     F   Initialise/Clear file
     G   Enter search data
     H   Print (and/or search) file
     I   Sort
     J   Transfer/append files(tape/disc)
     K   Compact the file
     L   Global field calculation
     M   Stop the program


           Filename  PEOPLE
```

TECHNICAL INFORMATION

The cassette version will allow up to 10 fields to be specified per record. Any number of files may be set up, and each file may hold about 110 records (based on a typical 5 field record).

The disc version allows up to 17 fields per record, and the only limitation as to the number of records, is the capacity of the disc. Typically, using 5 fields, about 2000 records may be stored on a 100k disc.

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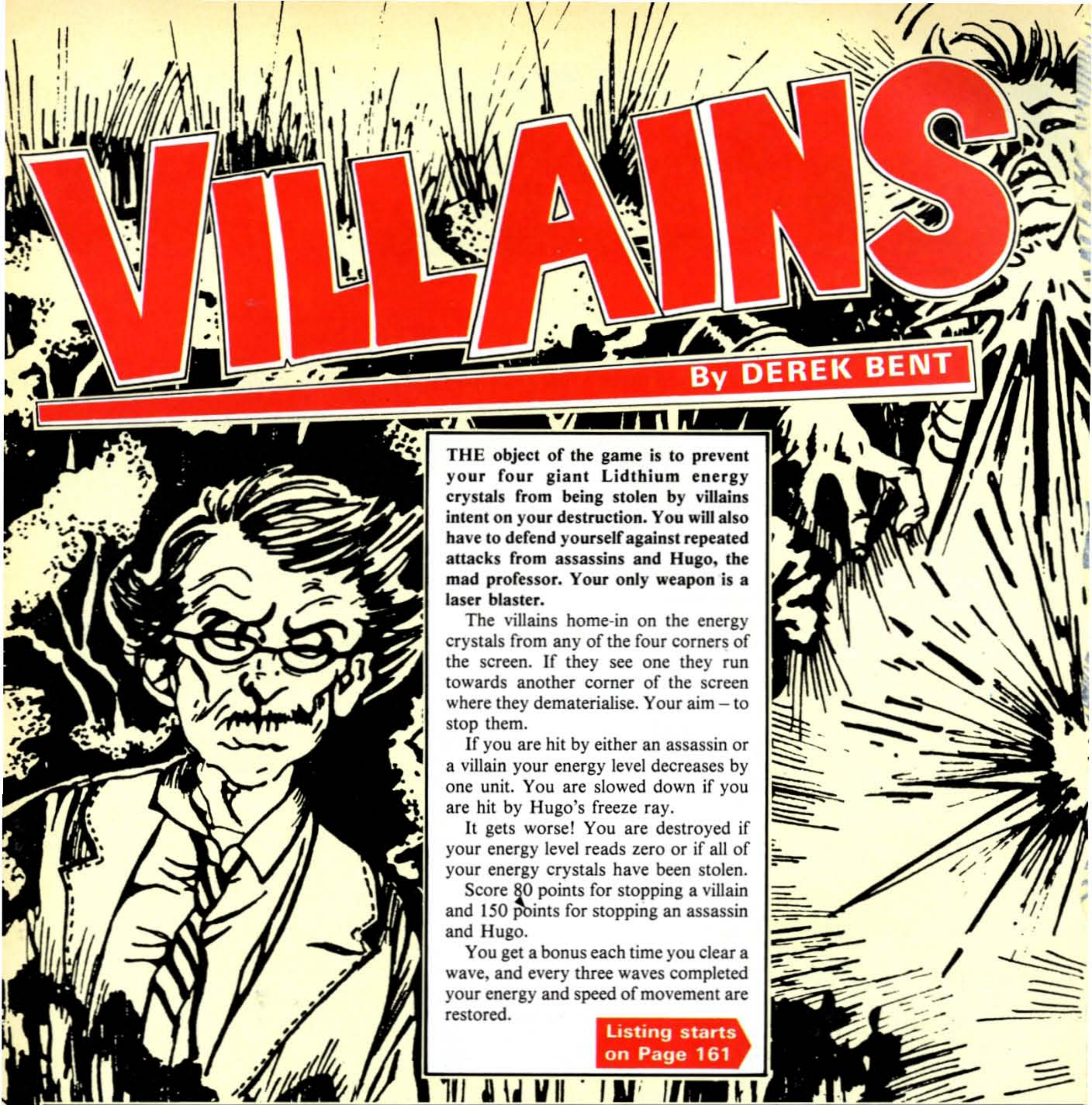

VILLAINS

By DEREK BENT

THE object of the game is to prevent your four giant Lidthium energy crystals from being stolen by villains intent on your destruction. You will also have to defend yourself against repeated attacks from assassins and Hugo, the mad professor. Your only weapon is a laser blaster.

The villains home-in on the energy crystals from any of the four corners of the screen. If they see one they run towards another corner of the screen where they dematerialise. Your aim – to stop them.

If you are hit by either an assassin or a villain your energy level decreases by one unit. You are slowed down if you are hit by Hugo's freeze ray.

It gets worse! You are destroyed if your energy level reads zero or if all of your energy crystals have been stolen.

Score 80 points for stopping a villain and 150 points for stopping an assassin and Hugo.

You get a bonus each time you clear a wave, and every three waves completed your energy and speed of movement are restored.

Listing starts on Page 161

VARIABLES

gold%	Flag for each of the crystals that indicates whether a particular crystal has been stolen.
xpos%	X coordinates of the left and right corners of the screen from which the villains appear.
ypos%	Y coordinates of the top and bottom corners of the screen from which the villains appear.
X%	X coordinate of the player's man.
Y%	Y coordinate of the player's man.
goldpos%(,1)	X coordinate of each of the crystals on the screen.
goldpos%(,2)	Y coordinate of each of the crystals on the screen.
x%	X coordinate of the villains, the assassins and Hugo.
y%	Y coordinate of the villains, the assassins and Hugo.
men%	Number of units of energy remaining.
print%	Determines which of the crystals is printed on any one loop of the program.
score%	Player's present score.
hugo%	Used inside PROChugo. Number of loops the procedure does before Hugo attacks the player's man.
C%	Used by PROCmovex. Contains the value added to the man's X coordinate. Also determines which user-defined characters, for the player's man, are used, depending on which way the man is pointing.
killed%	Remaining number of villains, assassins and Hugos to be killed before a wave is completed.
waves%	Number of waves completed.
dist%	Distance the assassins can venture in from the sides of the screen.

HI$	Names of players on the high score table.
HI%	Scores of players on the high score table.
col%	Major general variable used in the program.

PROCEDURES

PROCinit	Defines characters used for the various parts of the villains, the player's man and the crystals. Also defines the sound envelopes and dimensions the various array variables.
PROCvar	Assigns initial values to the main variables used in the program.
PROCscreensetup	Draws screen and sets up a graphics window. Displays all the crystals and draws the player's man in the centre of the screen.
PROCscore	Displays present score at top of screen.
PROCkey	Takes inputs from the keyboard and assigns the appropriate move procedures.
PROCmovex	Updates X position of player's man unless at edge of screen.
PROCmovey	Updates Y position of player's man unless at edge of screen.
PROCgun	Fires laser in the direction the player's man is pointing. Checks to see if anything has been hit.
PROCvillain	Contains the loop for the movement and the actions of the villains.
PROCassassin	Contains the loop for the movement and the actions of the assassins.
PROChugo	Contains the loop for the movement and the actions of Hugo.
PROCgameover	Draws a sunburst type explosion over the player's man.
PROChitable	Displays high score table.

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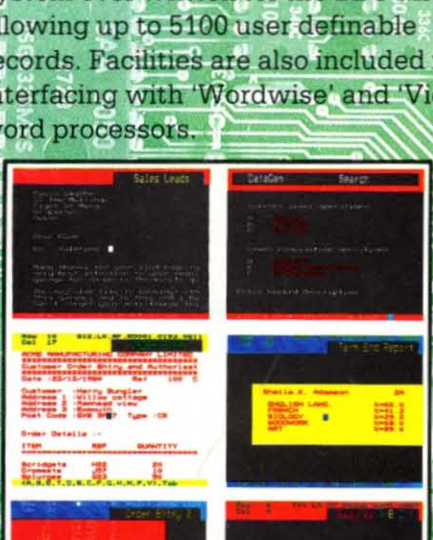

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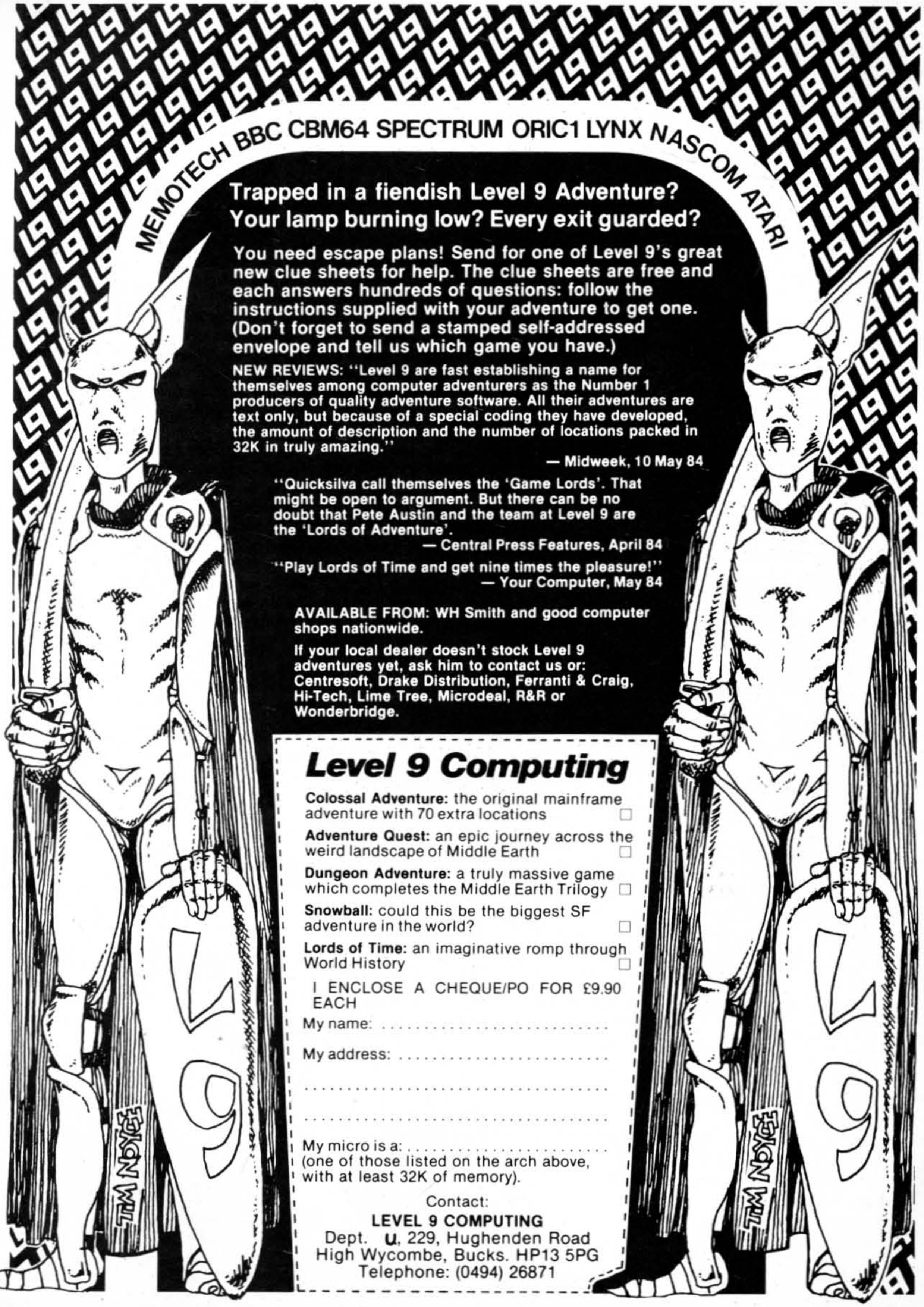

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— Your Computer, May 84

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Give your films that STAR TOUCH

ALAN McLACHLAN demonstrates how to create titles for your home video

AS the video recorder becomes a standard feature in the average household, those fortunate enough to own cameras are naturally producing homemade video films.

Often they need to create suitable opening captions or closing credits to add a touch of professionalism to their final product.

Reasonable results can be obtained using the camera with suitably prepared artwork. This can range from freehand drawn and painted letters to work of a highly professional standard using commercial letter transfers such as Letraset.

This is fine in its way, but the range of letters needed for variety can prove expensive.

In the past I have achieved good results using my BBC Micro to generate screens of text which are then recorded on a video tape recorder (VTR).

It is a simple matter to remove the normal TV aerial lead from the VTR input and replace it with the lead from your BBC aerial socket. In effect you insert the VTR between your computer and the TV, as in Figure I.

Then switch on all three machines, not forgetting to insert a suitable cassette, and select an unused channel on the VTR. Choose the channel on the TV that you normally use as the VTR monitor and tune the VTR to the signal from the BBC Micro.

You should at this point be able to obtain the BBC Micro's switch on screen. If you can't, carry out the following checks:

- Is everything switched on?
- Are all leads correctly inserted? That is, R/F out from computer to R/F in VTR, R/F out VTR to aerial socket in the TV.
- Is the VTR channel tuned correctly to the BBC signal?
- Is the TV channel correctly tuned to the VTR?

If you now run the appropriate program in the computer, all you need to do is press Play/Record or the similar switches on your VTR and any length of program can be recorded. The results can be checked by rewinding the tape and playing it.

Now let's look at the sort of programs we can use to achieve the best results. Mode 7 is simple to use and very good title screens can be produced using a combination of single and double height characters as in Program I.

Lines 100-130 define a procedure which creates a line of double height characters. It takes the following parameters:

msg$	*Text content*
X%	*X coordinate of the text*
Y%	*Y coordinate of the text*
C%	*Text top line colour*
D%	*Text lower line colour different*

Lines 140-160 define a procedure which creates a line of single height characters. It passes similar parameters to the previous procedure. You can modify the program by inserting your own text strings in lines from 50 to 90.

For anyone with the inclination and funds, time and trouble can be saved by using a commercially produced Teletext on-screen editor.

I have achieved superb results using Datext by Optima Software. The contents of the screen can be pushed around until you achieve the required result and the screen can then be saved

```
   10 REM ***PROGRAM I***
   20 CLS
   30 VDU23;8202;0;0;0;
   40 A=GET
   50 PROCdbltext("St.
Peters",12,6,129,131)
   60 PROCdbltext("S C H O O L    S P
O R T S    D A Y ",1,12,131,131)
   70 A=GET
   80 PROCsngltext("Friday 29th June
1984",7,20,135)
   90 REPEATUNTIL0
  100 DEFPROCdbltext(msg$,X%,
Y%,C%,D%)
  110 PRINTTAB(X%,Y%)CHR$141;
CHR$C%;msg$
  120 PRINTTAB(X%,Y%+1)CHR$141;
CHR$D%;msg$
  130 ENDPROC
  140 DEFPROCsngltext(msg$,V%,W%,C%)
  150 PRINTTAB(V%,W%)CHR$C%; msg$
  160 ENDPROC
```

Program I

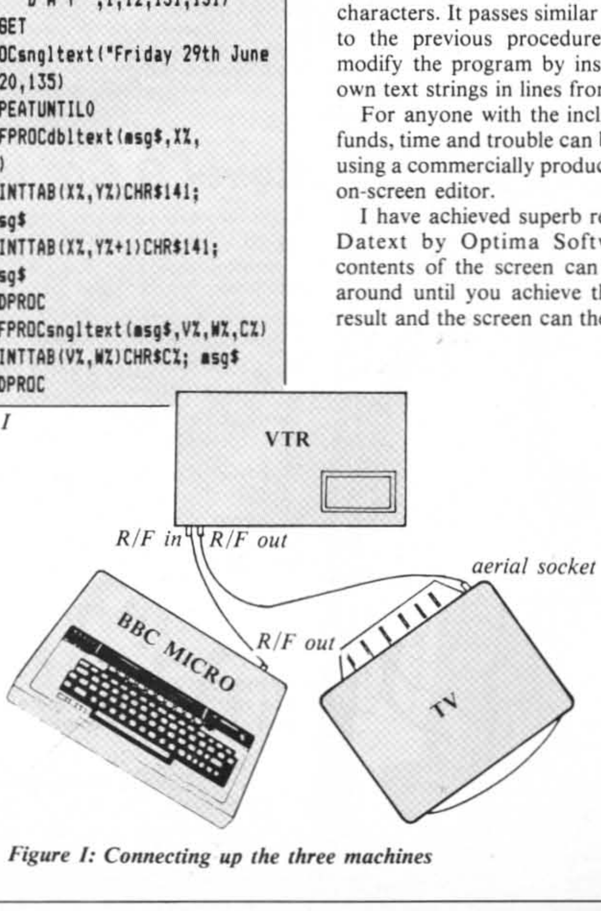


Figure I: Connecting up the three machines

OPTIMA SOFTWARE
Datext
... the teletext editor

Datext by Optima Software

as a program and recalled under key control.

The screen editor in the August 1984 issue of *The Micro User* is also suitable for this purpose.

Programs which use the BBC's graphics facilities can be written in other modes. Program II demonstrates the use of Mode 5 by creating large characters out of square blocks.

Lines 220-240 define the block character. This is used in PROCbbc to create the large text. In PROCband it is used again alternately with an undefined character to produce the black and white check.

Lines 30-110 place the characters on screen using two separate text graphic windows.

Program III demonstrates a simple use of Mode 5 text but printed on the graphic screen using MOVE and VDU5. This enables better centring of odd numbered characters on a screen with an even number of TAB positions.

When the REM statements at lines 50 and 60 are removed a vertical line is drawn down the centre of the screen – an invaluable aid when centring text. It can be removed later.

Program IV uses the BBC's superb string handling facilities to produce animation. Line 90 and 100 define the two lines of text to be used.

Lines 110-190 pick out each individual letter of A$ and place it on the screen in a different colour. Lines 220-300 do the same with B$. Lines 340-440 take the complete strings A$ and B$ and move them toward the centre of the screen. Lines 490-579

The BBC, in common with other systems, has both RF (normal TV), and video outputs. The results from the video output are of a much better quality, but its uses are somewhat restricted and the benefits will only be noticed with the use of a monitor.

Regrettably, without modification the BBC video output is black and white. However the modifications are quite simple and depend on the issue of board in your micro. In order to achieve colour output a link must be made at S39.

On boards from issue 7 onwards this is done by sliding a shorting connector over the two pins at this location. On earlier boards the modification is a little more complicated and fiddly.

The modification was explained in detail in an answer section of the August 1983 issue of The Micro User Micromail (Colour Clue, Page 107).

All you need to do is to connect a 56 picofarad capacitor between R123 and Q9.

Solder one end to the resistor and put a piece of insulation sleeving over the other before attaching it to the emitter of the transistor. The results of both operations should be identical – colour video output.

If you do not feel competent to carry out this modification yourself, your dealer will be able to do it.

```
   10 REM ***PROGRAM II***
   20 MODE5
   30 COLOUR134:CLS
   40 GCOL0,0
   50 VDU23;8202;0;0;0;0;
   60 PROCchars
   70 VDU5:MOVE250,734
   80 PROCbbc
   90 VDU5:MOVE280,762
  100 GCOL0,1
  110 PROCbbc
  120 VDU24,0;146;1279;300;
  130 GCOL0,135:CLG
  140 VDU5:MOVE0,300
  150 GCOL0,0
  160 PROCband
  170 VDU24,0;800;1279;954;
  180 CLG
  190 VDU5:MOVE0,954
  200 PROCband
  210 REPEATUNTIL0
  220 DEF PROCchars
  230 VDU23,224,255,255,255,
  255,255,255,255,255
    240 ENDPROC
    250 DEF PROCbbc
    260 VDU224,224,224,224,8,8,
  8,8,10,224,9,9,224,8,8,
  8,8,10,224,224,224,224,
  8,8,8,8,10,224,9,9,224,
  8,8,8,8,10,224,224,224,224
    270 VDU224,224,224,224,8,8,
  8,8,10,224,9,9,224,8,8,
  8,8,10,224,224,224,224,
  8,8,8,8,10,224,9,9,224,
  8,8,8,8,10,224,224,224,224
    280 VDU224,224,224,224,8,8,
  8,8,10,224,8,10,224,8,
  10,224,8,10,224,224,224,
  224,8,8,8,8,10
    290 ENDPROC
    300 DEF PROCband
    310 VDU224,255,224,255,224,
  255,224,255,224,255,224,
  255,224,255,224,255,224, 255,224,255
    320 VDU255,224,255,224,255,
  224,255,224,255,224,255,
  224,255,224,255,224,255, 224,255,224
    330 VDU224,255,224,255,224,
  255,224,255,224,255,224,
  255,224,255,224,255,224, 255,224,255
    340 VDU255,224,255,224,255,
  224,255,224,255,224,255,
  224,255,224,255,224,255, 224,255,224
    350 VDU224,255,224,255,224,
  255,224,255,224,255,224,
  255,224,255,224,255,224, 255,224,255
    360 ENDPROC
```

Program II

```
    5 REM***PROGRAM III***
   10 MODE5
   20 COLOUR135:CLS
   30 VDU23;8202;0;0;0;
   40 VDU19,2,4,0,0,0
   50 REM GCOL0,0
   60 REM MOVE640,0:DRAW640,1024
   70 PROCtext("THE",552,700,0)
   80 PROCtext("MICRO USER",332,600,0)
   90 PROCtext("p r e s e n t
 s",190,400,2)
  100 REPEATUNTIL0
  110 DEFPROCtext(msg$,X%,Y%,C%)
  120 VDU5
  130 COLOUR3
  140 GCOL0,C%
  150 MOVEX%,Y%
  160 PRINTmsg$
  170 VDU4
  180 ENDPROC
```

Program III

From Page 103

repeat the procedure but in a vertical direction.

You can adapt these programs to your own use by changing the string contents in Programs I, III, and IV, or by altering the shape of the big letters in Program III.

If you have access to sophisticated editing equipment – or just a second VTR – it wouldn't matter in which order you recorded your items.

Selected sections of film, captions or otherwise, can be edited sequentially on a new tape with surprising ease by connecting one VTR directly to another, using one as a source on Play and the other as a target on Record.

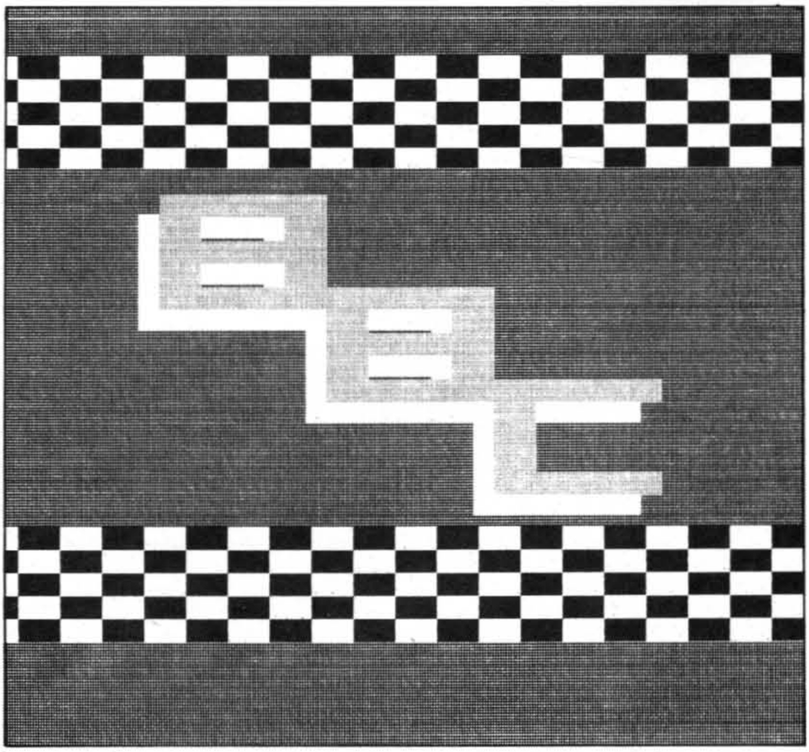
Naturally there will be some deterioration in the rerecorded material but this will not be excessive.

I have been fortunate in the past to have use of a Panasonic home video console which not only allowed picture editing at the touch of a button, but permitted sound mixing as well.

Without sophisticated facilities you must record your items in the order that they will be required in the finished product:

- Record opening title from BBC.
- Record film on camera
- Record final credits/The End.

As you can well imagine, this calls for a lot more preparatory work in order to save time and trouble later. But it is worth spending that little bit longer with a pencil and paper deciding the correct order and length of your items.



Although I have only described simple ways of producing captions, there is still plenty of room for experiment. I have achieved excellent results using these methods – and it really can be quite good fun and extremely rewarding.

You could even create animation by clever manipulation of the Record/Pause buttons and several screens of characters and text.

I haven't tried this and would advise you to attempt the simpler techniques first.

```
 10 REM***PROGRAM IV***
 20 MODE5
 30 COLOUR131
 40 VDU23;8202;0;0;0;
 50 VDU19,2,4,0,0,0
 60 CLS
 65 A=GET
 70 X%=12
 80 C%=0
 90 A$="ANIMATED  "
100 B$="CAPTIONS"
110 FOR A%= 1 TO LEN(A$)
120 COLOURC%
130 AA$=MID$(A$,A%,1)
140 PRINTTAB(X%,12),AA$
150 X%=X%+1
160 FOR D%=1 TO 1000:NEXT
170 C%=C%+1
180 IF C%>2 C%=0
190 NEXT
200 A=GET
210 S%=0
220 FOR A%= 1 TO LEN(B$)
230 COLOURC%
240 BB$=MID$(B$,A%,1)
250 PRINTTAB(S%,16),BB$
260 S%=S%+1
270 FOR D%=1 TO 1000:NEXT
280 C%=C%+1
290 IF C%>2 C%=0
300 NEXT
310 A=GET
320 X%=12
330 REPEAT
340 PRINTTAB(X%,12),A$
350 FORD%=1 TO 1000:NEXT
360 X%=X%-1
370 UNTILX%=5
380 S%=0
390 REPEAT
400 PRINTTAB(S%,16),B$
410 PRINTTAB(S%-1,16)," "
420 S%=S%+1
430 FOR D%=1 TO 1000:NEXT
440 UNTILS%>6
450 A=GET
460 Y%=14
470 Z%=18
480 REPEAT
490 COLOUR0
500 PRINTTAB(6,Y%-4),A$
510 PRINTTAB(6,Z%),B$
520 PRINTTAB(6,Y%-3),STRING$(8," ")
530 PRINTTAB(6,Z%-1),STRING$(8," ")
540 Y%=Y%-1
550 Z%=Z%+1
560 FORD%=1 TO 1000:NEXT
570 UNTILY%<8
580 VDU19,0,8,0,0,0
590 REPEATUNTIL0
```

Program IV

Log-on
Plug into the exciting world of telecomputing!

The binary beacons are lit..

By MIKE COOK

DATA communication, in one form or another, has been around as long as man has.

The earliest forms of long distance communications worked on a binary system. The beacons built to warn of the Spanish Armada were capable of transmitting a single binary bit – invasion on, lit.

The American Indians with their smoke signals added a little variety by transmitting a series of different shapes of smoke columns.

Even the jungle drums of Africa used rhythms to convey messages.

All these systems were a little limited because the patterns transmitted conveyed whole messages. The breakthrough came when the letters of an individual language were broken down and given their own unique code.

Perhaps the first to do this was the navy with its semaphore flags. In this system two flags can be held in one of six positions, thus giving enough combinations for the whole alphabet.

The advent of electrical means of sending data vastly increased the distance over which it could be sent. This however called for new methods of serialising data.

I am sure you have all seen the Westerns where the town is connected to the outside world by a single telegraph wire. It was always cut just before the bank was robbed.

In the early telegraph systems this single wire could carry current or no current – another binary system.

Each letter was therefore broken down into a series of long and short duration current pulses known as dots and dashes.

This was known as morse code – not that Samual Morse invented it, just that he had the money to back it.

The electric telegraph and the morse code it used were in fact invented by an eccentric Englishman, Sir William Fothergill Cook *(to the best of my knowledge no relation).*

As the demand for communications grew, it became apparent that morse code was not the most efficient method as it took a trained operator to use it. What was needed was a system for untrained people.

Many patents and ingenious devices attempted to decode morse code mechanically. But it was not until decades later with the advent of computers that this could be fully realised.

The snag was that morse was designed to be learned by a person, not by a machine – different letters contained differing numbers of elements and lasted for differing times.

To overcome this people decided to invent a machine-based system. This was done by an American called Baudot.

His system consisted of five piano type keys, three for the right hand and two for the left. When the keys were depressed an ingenious system of cogs, clutches and cams scanned the keys and keyed the line.

At the remote end an even more ingenious mechanical spaghetti manoeuvred a cylindrical printing head so that the correct letter was typed on paper.

This system still took a trained operator at the sending end, as the keys to press for any letter had to be learned. But it did represent a vast improvement.

It so affected Americans that they still call five bit data codes "Baudot code" even though that has not been used since the 1914-18 war.

An English engineer called Murray took the next big step by inventing an asynchronous form of data transmission which is very similar to that used in modern computers.

It was designed to be used with punched tape, the code being arranged so that the most frequently used letters had the fewest holes, thus improving the strength of the tape.

It was also possible to rub out a character by making all the paper tape positions into holes. In this way errors could be corrected before transmission.

The transmission mechanism consisted of a three row keyboard and a paper tape reader. The keys were in the conventional Qwerty sequence with the numbers shifted above the Qwerty keys on the top row.

The transmission line could be in two states. Today we call them logic levels zero or one, but the early telegraphers referred to the states of the line as mark and space.

Mark was the natural state of the line and a space the driven state.

Each character starts by the line being driven to the space state for one unit of time. This is known as a start bit as it signifies the start of each character. The data is then sent in the next five time slices.

The line is placed in the mark state and the next start bit can begin when it has been in this state for at least one and a half time slices. This is shown in Figure I.

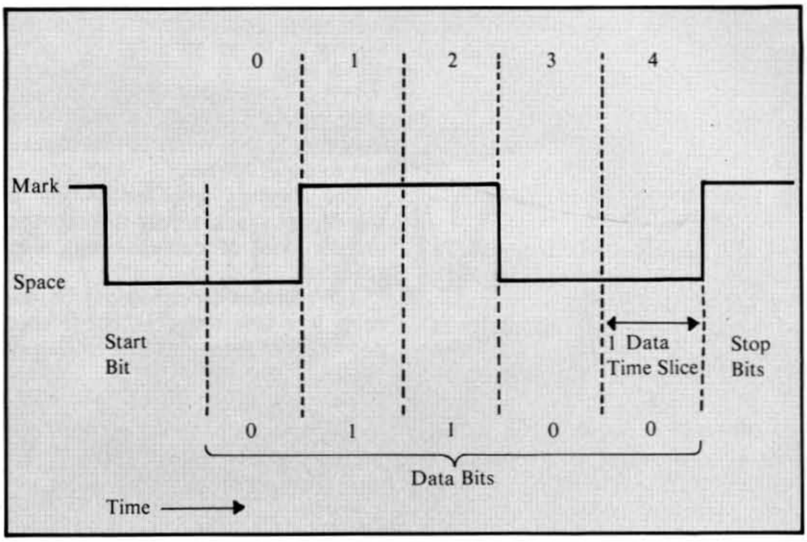


Figure I: Asynchronous five bit data.

The format of the data is said to be one start bit, five data bits and one and a half stop bits.

The time of each data element had to be long enough for cogs and clutches to engage, and so these early machines were limited in speed. They usually ran at 50 baud.

A baud is one data time slice per second, with seven and a half bits making up a character. This works out at about six and a half characters per second, a little slower than a competent typist.

As there were five data bits, only 32 different code patterns could be generated. This is not enough for all the letters of the alphabet together with the numbers and punctuation, so the concept of control codes was introduced.

On receipt of a letter shift code all subsequent codes were treated as letters. To print numbers and punctuation a figure shift code had first to be sent.

This code was known after its inventor as Murray code, although the Americans still called it Baudot code. A very similar code is still in use today on the Telex network.

Only a few characters have been changed since Murray's original code. People sometimes wrongly call it Murray code and the Americans still insist it is Baudot, although officially it is ITU Telegraph Alphabet No 2.

Many early computers used five-unit codes and modified teleprinters to communicate with the users. Names like Elliot 803 auto code still bring wistful smiles and nostalgic sighs to programmers with over 20 years in the business.

Most of the earlier computer manufacturers agreed to adopt a standard method of coding their data. The exception was IBM which decided to go it alone with its own codes.

Being big enough to do this, IBM forced the user to buy from them. Everybody else decided to adopt Ascii (American Standard Code for Information Interchange). Ghastly isn't it, but it improves if you say it with a mid-south cotton picking accent.

Ascii – pronounced Askey, as in Arthur – is a 7 bit data code employing a start bit and one or two stop bits.

There are codes for all the letters and numbers as well as punctuation and other symbols. There are also codes to control the action of a mechanical terminal.

As most terminals are now visual display units a lot of the original definitions do not make sense, so various manufacturers have interpreted them to have various effects such as flashing characters.

This produces incompatibilities in what is supposed to be a compatible system. If you look at the VDU commands on the BBC Micro you will see how these control codes have been interpreted by Acorn. They exploit the unique features of the BBC Micro.

With the advent of micros and their 8 bit data buses, serial data with 8 bits became more popular, as it is convenient to transmit a byte in one word. Also parity has been included.

Parity is an extra bit set in such a way that the total number of mark states

→

From Page 107

transmitted – including the parity bit – is an odd number.

This is known as odd parity. To complicate matters, you can use even parity.

At the receive end the parity is recalculated and if it does not agree with the received parity there must have been an error.

If the parity is correct then it is assumed there is no error although you can have two errors cancelling each other out. Therefore the inclusion of a parity bit makes some combinations of bits or codes not valid, or as we say redundant.

Thus in any serial system both transmit and receive both have to be set to the same word format – number of data bits, number of stop bits and odd, even or no parity.

The other aspect of serial data transmission which needed standardising was the physical state of the transmission lines for mark and space.

Early machines used a current loop system. A 20mA was the common standard. This had 20mA flowing round the circuit in one direction for a mark and in the reverse direction for space.

The current was used to drive a relay which operated the electro-mechanical clutches.

As this is a constant current system the driving voltage has to increase sufficiently to get the required amount of current flowing.

On a short line this is not very much, but on a long line or under open circuit conditions it could rise to about 180 volts, enough to give you a nasty shock.

With the advent of non-mechanical terminals this current was not needed, so a voltage standard arose. This is the RS 232, which not only specifies the voltage levels for mark and space but also specifies what plug to use and what signals are on what pins.

A space is represented by any voltage between 3 and 15 volts, but most people use 12 volts. A mark condition is represented by a negative voltage of the same size.

The RS423 system used by the BBC Micro is an improvement on the RS232 while still being compatible under most circumstances.

The RS423 has a space being represented by any voltage between 0.2 and 6 volts and a mark being the same in the negative direction.

It is an improvement as the impedance of the lines is lower, allowing signals to be less prone to interference and to travel further.

The standard specifies how far a signal path should be. As this depends on the type of cable, this is also specified.

The technical specification for the cable is a little technical, but it boils down to not being too thin or closely spaced.

The cable should be 24 AWG (American Wire Gauge) or larger. It should have a DC resistance of not greater than 98ohm/km and the capacitance between one wire and all others within the cable should not exceed 131 pF/m.

Using a cable of this sort with a data rate below 1,000 baud the system should be capable of being used over 1,000 yards.

As the data rate goes up this distance drops, so that at 10,000 baud it is down to 100 yards. Remember, this is with a standard cable.

As well as the signal path, this standard also specifies other protocol or handshaking signals. These are mainly designed to be used by a modem for telephone conversations.

The BBC Micro provides only two – an RTS (request to send) and a CTS (clear to send).

Just to confuse matters these are the reverse logic sense of the data. This means that when the signal line is active – that is, making a request to send data – it has a positive voltage on it.

The names of the signals are self explanatory. RTS says: "I want to send some data", whereas CTS is saying: "You are clear to send me some data". So RTS is an output and CTS is an input.

Confusion arises because you must always connect an input to an output. However the RTS line must always be connected to the same pin on the socket according to the standard. Therefore on some equipment RTS is an input receiving the request from the transmitter.

In order to know which way round to connect things you have to know whether your equipment is considered to be Data Terminal Equipment (DTE, where RTS is an output) or Data Communications Equipment (DCE, where RTS is an input).

When there were only mainframe computers to worry about it was all very simple. The computer and the terminal were DTE and the two modems connecting them were DCE.

However with the advent of micros people wanted to connect the computer directly to the terminal, and so some makers configured their computers as DCE.

This allowed a normal lead to be used. However if a computer is configured as DTE then a special cable has to be used with crossover connections. For example, pin 4 on one plug would connect pin 5 on the other.

This confusion also applies to the two data lines labelled Transmitted Data (output on DTE) and Received Data (input on DTE).

It is hardly surprising then that sometimes the only way to find out is to experiment.

Some of this confusion is avoided on the BBC Micro by the "special feature" of not having a standard plug. This plug is capable of being inserted in two ways in the socket.

It would have been nice if this would swap over the appropriate signals, but for some reason it was not wired up that way.

The really useful aspect of having a standard (of sorts) interface built into your computer is that you can communicate with other machines of the same or different sort.

I have transferred programs from my TRS-80 into the BBC machine via this route. As the Basic is very similar, programs would run provided there were no graphic commands (in effect trivial programs).

Also the screen width is different, and so screen formatting is wrong. However it has been of significant use when transferring data files between machines.

When information in the form of the written word is required computer compatibility does not matter.

It is possible to "talk" to computers all over the world. You can extract information from them or leave messages on them.

The methods of communications are very much more efficient and sophisticated now than they have ever been. However that is not to say we have anything useful to say to each other.

As an example of this, just after the 1984 budget I logged onto the Prestel computer only to be informed there was a new message for me. It was from a wine merchant offering wine at "pre-Budget prices".

Well wine came down in the Budget, so he was either very stupid or very clever. Think about it!

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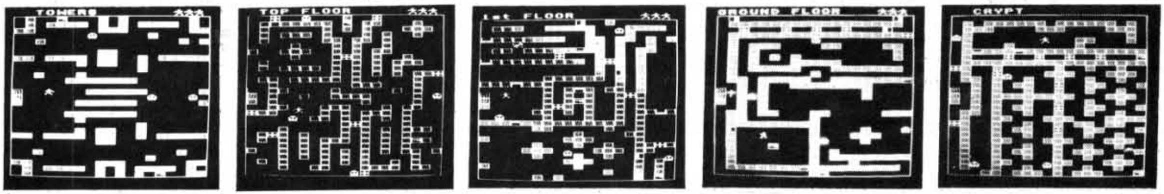

Turn off the lights and gather around for the most creepy game of the year. How you laughed at those superstitious fools in the village when they warned you not to go near the old house. The climb up the rocky path under the afternoon sun was swift and within an hour you had passed through the outer gates of this once great house. The dust and cobwebs hadn't bothered you as you climbed the old stairs to the towers on the top level. Did you notice how low the sun had fallen before the sounds of locks clicking reached your startled ears? How can the moon be out already and what's that moving towards you??? This all action game will have you ducking and diving from the GHOSTS and ZOMBIES, and matching wits with a MUMMY, WEREWOLF, and VAMPIRE. 5 floors full of odd CORRIDORS, BROKEN FLOORBOARDS, and riddled with SECRET PASSAGES await you. Superb sound effects and graphics. Can be played using either keyboard or joysticks. Top table. Pause option.

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B) COLOUR BLOCKS bring sizes and colour into perspective.
C) MERRY MUSIC turns the keyboard into a musical keyboard.
D) FUNNY FACES presents a line up, which one is the suspect?
E) FRED THE FROG needs co-ordinated help to get across the pond.

EARLY YEARS 2
A) THE POND seems very active today
B) SPEED is required to keep the cake on the conveyor belt.
C) DIRECTIONS seem to be needed by everyone in Orion village.
D) ORDER the blocks.
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For just £1 a week you can get an awful lot out of Prestel and Micronet 800

MORE and more BBC Micro owners are accessing Prestel, British Telecom's vast database. It's not surprising, for with its Mode 7 screen, the BBC machine is ideal for receiving Prestel via an appropriate 1200/75 baud modem. Here, STEVE GOLD takes a look at how Prestel has developed, and what it's got to offer the BBC Micro.

MOST teletext systems are a trade-off between speed of access and number of pages. The number of pages broadcast via British teletext – Ceefax and Oracle – is around 600, with about 10 per cent of Ceefax pages allocated to telesoftware.

Prestel, or viewdata as it is generally called, started life in the research laboratories of the then Post Office at Martlesham Heath in Suffolk.

In the late '60s and early '70s the department was examining the possibilities of developing viewphone, a service which would enable two people to see as well as talk to each other.

This scheme was eventually shelved as uneconomic, but the seed of viewdata was sown.

In 1974 the Post Office developed a viewdata system and showed it to TV manufacturers. The response was favourable and in 1975 the first steps were taken in producing viewdata televisions.

The Post Office viewdata pilot trial opened in 1976 for research purposes and two years later was extended to 1,500 subscribers in London, Birmingham and Norwich under the name of Prestel.

It soon became obvious that the £400 premium on the price of a Prestel TV set was too high for the residential user. This, coupled with high access charges, severely restricted market penetration.

The system limped along with 10,000 to 15,000 users until the light dawned on firms that here was a tailormade business medium.

So Prestel Citiservice and Skytrack were born and business take-up blossomed. The emphasis was now on business users, and the poor old home users were neglected. Until, that is, someone hit upon the idea of converting micros to work with Prestel.

Prestel continued to blossom and in 1982, Birmingham-based Viewfax brought out a database – a group of pages – aimed at micro users and that means mainly BBC users.

Viewfax offered them a mixture of news and views, together with a number of telesoftware programs. Several were free, but the better ones were chargeable by frame charges added to the Prestel bill each quarter.

Viewfax's main problem was the quandry most information providers find themselves in. If they charge for their frames, the number of frame accesses – the number of times viewers key in to the pages – is low. If they make the pages free, many people access the frames but there is no income for the information providers.

In practice Viewfax has developed into an interesting database with several hundred pages to look at. However, as in most businesses it cannot afford to put out too many pages or the £5 a page a year rental it pays to Prestel will cause financial headaches.

So with information providers one tends to find a chicken and egg syndrome. More pages are needed to generate more income, but those pages cost – so slow growth is the norm.

Viewfax, however, continues to provide a steady stream of information to BBC Micro users.

Late in 1982 East Midlands Allied Press, publishers of several regional newspapers, hit upon the idea of charging Prestel users a subscription rather than lots of small frame charges of pennies and ha'pennies.

In 1983 they launched a new service – Micronet 800 – aimed squarely at micro users. Cost? The basic subscription to Prestel is £5 a quarter, and the access charge is 5p a minute is used between 8am and 6pm Monday to Friday, or between 8am and 1pm on Saturday. Outside these hours there is no access charge. So it can be seen that apart from a local telephone call most residential users need pay little more than the £5 a quarter Prestel subscription if they stick to cheap rate, off peak times.

Micronet subscriptions are an extra £8 a quarter, resulting in a combined quarterly bill for Prestel and Micronet of £13 – just £1 a week.

For this the average micro user gets 100 free programs (if one excludes the telephone charges) and 40,000 pages of news, views and telesoftware. Plus, of course, access to the full Prestel database – some 250,000 pages.

The opportunity offered to software producers to place chargeable telesoftware on the Micronet database has not been missed. Big sellers are available for downloading at around 80 per cent of their retail price, which, when taken in with the convenience factor – no trip to the micro shops – is very good value.

The availability of telesoftware is, in fact, its greatest attraction. A program which may not warrant the full retail price of, say £8 could be available on Micronet or Viewfax for £2. With no distribution costs, the break even point to the author is very low.

The nearest analogy to Micronet 800 is that of an electronic computer magazine – constantly changing with up to the minute news and information.

It is possible to get by with just the basic Prestel subscription of £5 a quarter, but most BBC users will find the extra £8 a quarter well worth it.

● ***Next month I shall look at the availability of other databases.***

Microweb... the most exciting thing to happen to the Beeb for yonks

OVER the past few months thousands of *Micro User* readers have logged on to Microweb and discovered for themselves why it's the most exciting thing to happen to BBC Micros for a long time.

However, trying to convey this excitement to someone who's never logged on is always difficult.

It's rather like trying to explain an adventure game to someone who's never played it . . . as the actress said to the bishop.

What I'm trying to do in this article is explain the adventure of Microweb to you. Not that I'll be giving you all the answers – what good is that sort of adventure?

No, I'll be attempting to give you enough insight into Microweb to make your own journey from then on. Where you go, and what you find, will be entirely up to you . . .

First of all, let's get the mundane essentials out of the way with a talk about equipment. You must use a 300 baud full duplex modem with 8 bit no parity – this, I'm afraid, means that Prestel/Micronet only modems are of no use.

And of course, you'll need some suitable software – we've published the sort of thing you'll need several times. However, here at *The Micro User*, we make no secret of the fact that we think Commstar is the best for this purpose.

Let's assume that you've dialled our number (061-456 4157) and have your modem set to 300 baud full duplex, with you set to receive.

Your modem, while of course attached to your micro and the phone line, should not as yet have "modem connect" set.

Wait until Microweb has answered your call and you can hear the high pitched whine of the carrier before you connect.

If you have Commstar running, all you need do then is to go into chat mode with "C". If it's your own home-brewed software, remember not to echo characters, add line feeds (if only at first) and make sure you're on 300/300 baud.

You should be greeted with the:

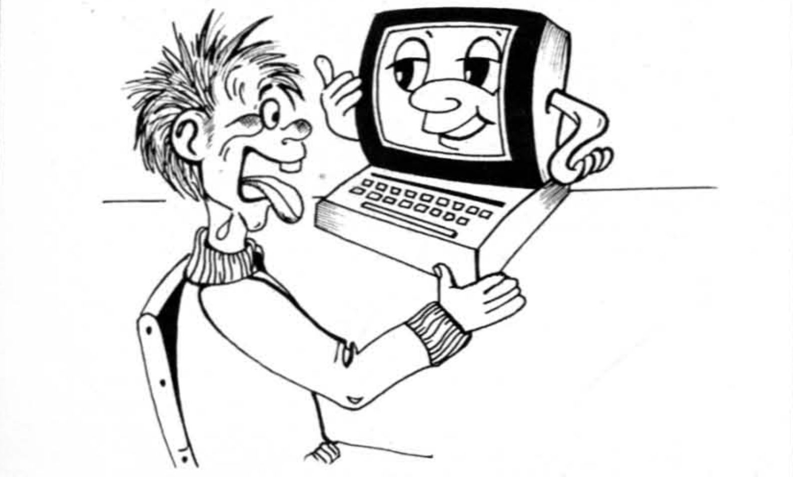
WELCOME
TO
MICROWEB

message, followed by a bit of "advertising".

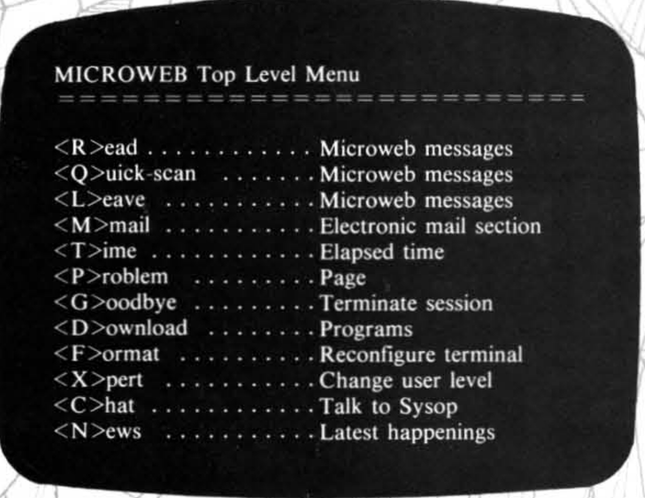
At this point, should you be met by garbage, don't give up. Try the next stage to solidify communications.

Microweb will ask you your first name, expecting your answer to be followed by a Return.

It will then quiz you for your second name and, finally, where you come from.



Microweb will ask you for your first name



```
MICROWEB Top Level Menu
========================

<R>ead ............ Microweb messages
<Q>uick-scan ....... Microweb messages
<L>eave ........... Microweb messages
<M>mail ........... Electronic mail section
<T>ime ............ Elapsed time
<P>roblem ......... Page
<G>oodbye ......... Terminate session
<D>ownload ........ Programs
<F>ormat .......... Reconfigure terminal
<X>pert ........... Change user level
<C>hat ............ Talk to Sysop
<N>ews ............ Latest happenings
```

Microweb's Top Level Menu

Even if you're unsure as to what's coming back to you, try to type this in correctly as it will become your unique ID.

The board will then echo it back to you for confirmation. If you answer no, you will be asked to repeat the process.

It's at this point that the board magically becomes clear for users who've previously had a lot of distortion – so persevere!

Next you'll be asked your terminal width – most of us would pick 40 – and then you'll be asked to enter the letter of your terminal.

As it stands at the moment it's rather a "choose one from one" situation – there's only one terminal to pick, the BBC Micro. This assumes that your micro can support both upper and lower case and needs no line feeds – that is, your software provides them.

However you can change this by either pressing Return when asked to pick the letter of your terminal, or by asking to modify your choice when you have made it.

In either case, you'll be asked again the width of your terminal, whether it supports upper and lower case, and if line feeds are needed. If everything appears on just one line, you need line feeds!

You'll also be asked if any nulls are needed in after each <cr> (Return). Your answer should always be 0. Nulls were padding/timing characters needed in the old, slow teletype days in order for the terminal to catch up with itself.

If you're asked for the clear screen code, it should be just 12 for the BBC Micro – other parameters asked for should be 0.

By MIKE BIBBY

All this sounds incredibly longwinded for something that, in practice, takes just a few seconds.

You'll then be informed what the last message on your last call was, what the current last message is and the time you're allowed on – a strictly rationed 12 minutes.

You'll then see the Microweb Top Level Menu – a set of single key instructions that will allow you to roam at will through Microweb. (See the screen above.) Before looking at the menu in detail, let's consider the general idea of Microweb.

This is simply an electronic bulletin board – ring in and leave your message for others who ring in to see. They reply to yours, or add their own subjects and so on.

And this, basically, is all Microweb is.

However, very soon, as with any bulletin board system, certain obvious categories of messages begin to occur that properly deserve their own board.

What we've done in Microweb is to provide the boards we feel necessary.

If you feel like letting off steam on a particular subject, or passing on a message to all and sundry, why not leave it on Microweb itself by choosing the <L> option from the menu?

You'll then be prompted carefully through the easily-learned procedure for leaving messages.

If however, you've got a programming query, don't leave it here. Choose <P> from the main menu and put it on Problem Page. That's where our problem-hungry experts look as soon as they log on.

If you fancy a look at the latest news and gossip, with unexpurgated Barry Woods and messages smuggled over the wire from Andrea, pick <N> from the main menu.

You might, of course, be using us as a dead letter drop to send messages privately to a particular person. In this case, choose <M> for electronic mail (E-Mail). Only people who log on as the intended recipient will see the message.

Incidentally, one of the commonest misuses of the board is people using the essentially private E-mail to send messages to ALL.

This will only send the message to the rather unlikely person who logs on as ALL.

If you wish your message to be read by all, including ALL, leave it on Microweb proper with <L> from the main menu.

Well, as you can see from the Top Level menu, we're only on the surface of the possibilities of Microweb. For example, we've totally ignored the software you can download.

In the next edition of *Log On,* I'll tell you more, but for the moment, why not log on and find out for yourself? After all, it's not an adventure if I tell you everything . . .

MICROWEB

NEWS...

From: Basildon Itec
To: All
Basildon Itec has just joined the 300 baud mob. We are thinking of setting up our own BB for our trainees to run. Any advice welcome. We have VIEWDATA host running on 0268 - 22177 unless the line being used by this system. More modems soon. Thanks.

From: Mike Bibby
To: All
We're still very very interested in getting submissions of games and educational programs – particularly in the educational field as that's where I hail from and I know there's an awful lot going on that's terribly parochial.

The material we've got already is very exciting. One of the things that amazes us here is that the level of software we get for the magazine tends to exceed that of commercial software produced only a few months before.

There are an awful lot of sophisticated programmers out there! We're also interested in new utilities – have you anything to contribute? Even if you aren't sure, why not send us a SAE for our programmers' and reviewers' guidelines?

Mike.

From: Paul Hollyer
To: All
Mr and Mrs Hollyer are pleased to announce their new acquisition. Delivered as at 10.45am on Sunday July 15, in Chesterfield. Only five days beyond advised delivery time (Sir Clive please note). An example of interfacing at its best. A micro weighing in at 8lb 4oz.

Originally designated the Model 2. Now universally addressed as "Robert James". Needs some further development, with complete programming, but hopefully will grow to a "main-frame".

P.S.: Many thanks to all at the Scarsdale Hospital, Chesterfield!

From: Bjarne Listlund
To: All
To all users on this databank. I hope we can make a user group for microbee owners we don't see one here in Denmark. I hope there are some users on this micro. Users there will please help me.

You can contact me on phone number 05 928959. If you will contact me on my modem you have to call after 1900 then I will answer you. Or you can write me on address: Bjergegade 69 7000, Fredericia DK-7000,Fredericia.

IN GENERAL...

From: Tim Crais
To: All
A joke.

Q. How can you tell that an Irishman has been at the word processor?

A. The Tippex on the screen.

From: Paul Hollyer
To: Sysop
Many thanks for allowing a member to wander at will, as the Board is so easy to use. Only query is – What is the difference between "<L>ine and <B>lock entry" mode? Also, why do my sentences get split up with "(1916)"?

From: Mike Bibby
To: Paul Hollyer
Line and block with prompts are much the same, you just type them in as normal. Ignore breaks, they don't show up on the message. It's just a simple way to write the software and the only way they could do it in the size of program they've got available – otherwise they'd be writing a full RS232 word processor. The numbers refer to the numbers of bytes left your allowed for this message.

The real advantage of block is that you can then transmit a whole file – say from disc – in one fell swoop – or block – and the board would accept it. Hope that's clear. Mike.

PROBLEM PAGE ...

From: Paul Hollyer
To: All

I've just got the second processor and I find that some of the ROM based *commands I have either don't work or operate in a restricted manner. An example are the commands with the Graphics Extension ROM. These work with the system integer A% normally, but with the second processor they fail, operating properly with numbers. HELP!!!

From: Des Riglar
To: Paul Hollyer

When running Basic the system variables (A%,B% etc) are stored from location &404 onwards. Each variable takes up 4 bytes of memory. When running in the main processor memory, but the sideways ROMs can access this memory, when running in the second processor the ROMs can't unless they are programmed to do so. All is not lost though, as when the operating system processes a star command (*ROTATE, *PLOT, *SCALE etc) the whole command line is piped to the main processor. Solution: Convert all commands to be performed into strings and use OSCLI. Example: Page 40 of User Manual, line 50 in main processor *POS J%,I%,90. To use in the second processor . . . OSCLI“POS ”+ STR$(J%) + “,” + STR$(I%) + “,90” Don't forget to put the spaces between the arguments. If you want to use the *GFX command then to get A% as seen in the main processor you will have to use OSWORD 5 to read from &404 and the next 3 bytes. This applies to B% & E% as well.

From: Richard Atkinson
To: Doug Weller

Hi Doug. On reading one of your letters about downloading with Commstar I followed it but when I tried to load it from disc “Bad Program” was the answer I received. Can you give me any HELP!

From : Doug Weller
To: Richard Atkinson

Most programs downloaded from BBs are in Ascii form (except for a couple on Computer Answers). This means that you have to *EXEC them first and then SAVE them as Basic programs. So you've got them OK just *EXEC them and SAVE again.

From: Mark Austen
To: All

Can anyone tell me the pin-out of the RS232 port on the Interface 1 for the Spectrum?

From: Dick Menhinick
To: Mark Austen

Hi – The ZX Interface 1 has the following pinouts: 1, No connection; 2, data input; 3, data output; 4, DTR (active handshake input); 5, CTS (active handshake output); 6, no connection; 7, ground; 8, no connection; 9 +9V (pull up). The connector on the interface is a DB9S (female) as you will need a DB9P to connect to it. Happy soldering.

THESE are typical messages that have appeared recently on Microweb – The Micro User's own bulletin board. All you need to log-on to us is a modem and suitable software. The Pace combination is ideal and, as you can see from the offer on Page 170, superb value for money.

As well as the bulletin board, there are news pages, programs to be downloaded and electronic mail. Log-on soon, and you'll see why they're saying Microweb's a must for every BBC Micro User.

The number to dial:
061-456 4157
The service is open
24 hours a day.

ANDY HOOD offers a short program to enable you to join the bulletin board set

A micro terminal for the asking..

IN my article in the July edition of *Log-on*, we looked at the easy way in which flows of data in the BBC could be directed at any or all of the three main output devices – screen, printer and RS423 port.

We also covered the equally easy manner in which data could be received from combinations of the keyboard, filing system and RS423.

In following through the concept of streaming data to and from different devices, and – in our application – creating a program to store data received at the RS423, we touched upon the concept of "buffering" data in memory until it was convenient to interrupt the program and process it by saving it onto tape or disc.

In doing this we mimicked, in a simple way, one of the most powerful features of modern micros.

You may have noticed when typing at the keyboard that even when the micro appears to be busy listing a program it still finds time to acknowledge your key press and, when it has finished its main task, display and act upon your input.

To do this, the micro must obviously be regularly interrupting the action of listing the program, checking to see if any keys have been pressed and if so, putting them into a temporary store or buffer.

This kind of almost invisible background task is occuring all the time and for obvious reasons is known as an interrupt routine. Frightening isn't it, what's going on behind your back!

The Beeb has one of the most comprehensive sets of interrupt routines of any modern micro and the majority of its input and output is buffered, in a similar way to the keyboard example, by these secretive routines.

The automatic storage and release of data collected in these various internal buffers means that short bursts of data can be sent or received at quite phenomenal speeds.

These can then be processed at a much slower rate, provided that the buffer is emptied before the next batch of data is received.

You may by this time be wondering why I am going into such detail about a routine that is carried out entirely automatically by the operating system and which on the face of it needn't concern us. The answer of course is that it does.

I mentioned last time we would be looking at the protocols or "etiquette" used in communications to ensure that both the sender and receiver of data are, as you might say, in "sync" with each other.

The most common of these protocols is the use by a receiving terminal of decimal codes 17 and 19 to tell a sending terminal when to stop and start data transmission. These are known by the mnemonics XON (17) and XOFF (19).

Simply put, they work something like this:

When a sending terminal receives the XOFF signal during the transmission of data, it should immediately cease sending characters until it receives the XON signal to instruct it to resume transmission.

Simple, you say, and so did I the first time I tried it. But this is where those interrupt routines beavering away in the background can cause problems.

You will probably be familiar with the term *baud* used as a measure of the speed of data transfer – 300 baud being roughly equivalent to 30 characters per second.

Imagine then our super fast machine code program – yes there's more to come – executing on average half a million instructions per second, placing characters in the RS423 output buffer which is only being emptied at the rate of 30 characters per second.

You can readily see that the program is going to spend nearly all its time waiting for the RS423 buffer to be emptied, and that at any point when we receive an instruction to stop placing characters in the buffer the interrupt routine will still have a full buffer to empty, which of course it will carry on doing after we have stopped.

Should this happen, we will still be sending characters to the remote terminal after the XOFF signal has told us that it is not ready to receive them.

Perhaps the obvious answer is to stop those interrupt routines from operating and indeed the 6502 processor does have a specific flag to either disable or enable them under user control.

This is known as the "I" flag and responds to the assembler instructions CLI – CLear Interrupt enable (that is, disable them) and SEI – SEt Interrupt enable.

However, using this method has two major drawbacks. More importantly the interrupt enable flag is not to be lightly tampered with on such a heavily interrupt driven machine as the Beeb (dabble at your peril!).

In addition, we would lose all the advantage of automatic data collection that the interrupt routines provide for us. Fortunately, and not surprisingly, the MOS again provides us with a routine to solve our problem in a more satisfactory way.

Much as the FX or OSBYTE call 145 that we looked at in the last article extracted characters from buffers and returned with a flag set to indicate whether it was successful or not, OSBYTE call 152 will check the appropriate input or output buffer and

Interrupts, beavering away in the background, can cause problems . . .

return with a flag set to indicate whether the buffer is empty or not.

The important difference is that it does not extract any data from the buffer, but merely checks its current status. If the buffer contains characters then the carry flag will be clear on exit and if empty it will be set.

We may then place a character into the output stream and repeatedly scan the buffer until the OSBYTE routine indicates that it is empty, ensuring that a queue does not form in the buffer waiting to be cleared by the interrupt routines.

In my previous article, I said that we would look at coding more of our terminal program in assembly language to increase its speed and flexibility.

The Micro Term program shown in Listing I is written entirely in machine code and as well as incorporating the XON/XOFF protocols for file transmission, it will allow you to copy incoming data to the memory buffer, save the buffer contents to, or load the buffer from, disc or tape and send the buffer contents to the RS423 port.

To assemble the program, first type PAGE=&3000 and then load the source code listing. Run the program and when the assembly is complete enter:

```
*SAVE MTERM 1A00 1D00 1A00
```

The program may then be run from disc or tape by entering *MTERM.

The following function keys are used to control the program's actions:

- **f0** Copy incoming data to the buffer. This is a "toggle" switch and will alternately switch the buffer on and off with appropriate status displays.
- **f1** Output the buffer to the RS423 port. This will send the entire buffer contents using XON/XOFF protocols.
- **f2** Save the buffer to disc or tape. Pressing this key will clear the screen and prompt you to enter a valid filename. The entire contents of the buffer are then transferred to a file which, if a Basic program, may be re-entered into the computer using the *EXEC filespec command.
- **f3** Load a file into the buffer for transmission using the f1 option. A filename prompt is given in a similar manner to the save option.

This short program will enable you to communicate with many bulletin boards, and of course with *The Micro User's* own Microweb system, and will allow you to both upload – send – and download – receive – both messages and programs.

The program is an example of how easy the BBC Micro with its powerful operating system can make machine code programming.

In the next article, we will look at how those curious assembler instructions work.

Happy hacking!

Micro Term listing

```
   10 REM Listing
I
   20 REM Micro Te
rm
   30 REM <c> Andy
 Hood 1984
   40 OSASCI=&FFE3
   50 OSWRCH=&FFEE
   60 OSBYTE=&FFF4
   70 OSFILE=&FFDD
   80 OSWORD=&FFF1
   90 buffstartl=&
70
  100 buffstarth=&
71
  110 bufftopl=&72
  120 bufftoph=&73
  130 buffpointl=&
74
  140 buffpointh=&
75
  150 buffer_flag=
&77
  160 operand=&76
  170 xon_xoff_sta
tus=&78
  180 start%=&1A00
  190 FOR opt%=0 T
O 3 STEP 3
  200 P%=start%
  210 [OPT opt%
  220 .entry
  230 \REM enable
RS423 input
  240 LDA #2
  250 LDX #2
  260 JSR OSBYTE
  270 \REM set up
transmit 300 ,rece
ive 300
  280 LDA #7
  290 LDX #3
  300 JSR OSBYTE
  310 LDA #8
  320 LDX #3
  330 JSR OSBYTE
  340 \REM set up
buffer & flags
  350 LDA #0
  360 STA buffstar
tl
  370 STA buffpoin
tl
  380 STA bufftopl
  390 STA xon_xoff
_status
  400 STA buffer_f
lag
  410 LDA #&1D
  420 STA buffstar
th
  430 STA buffpoin
th
  440 STA bufftoph
  450 \REM program
 loop
  460 \REM #######
  470 .mainloop
  480 JSR getchar
  490 BCS check_ke
yboard
  500 JSR display
  510 LDX buffer_f
lag
  520 BEQ check_ke
yboard
  530 JSR storecha
r
  540 .check_keybo
ard
  550 JSR keyboard
_scan
  560 BCS mainloop
  570 JSR sendchar
  580 JMP mainloop
  590 .getchar
  600 LDA #145
  610 LDX #1
  620 LDY #0
  630 JSR OSBYTE
  640 BCS nochar
  650 TYA
  660 RTS
  670.nochar
  680 RTS
  690 .wait
  700 LDA #152
  710 LDX #2
  720 LDY #0
  730 JSR OSBYTE
  740 BCC wait
  750 RTS
  760 .sendchar
  770 PHA
  780 JSR toRS423
  790 JSR wait
  800 PLA
  810 JSR OSWRCH
  820 RTS
  830 .increment_s
tore
  840 INC bufftopl
  850 BNE nocarry1
  860 INC bufftoph
  870 .nocarry1
  880 RTS
  890 .increment_p
ointer
  900 INC buffpointl
  910 BNE nocarry2
  920 INC buffpoin
th
  930 .nocarry2
```

Turn to Page 171

Talking to big brother

By JOHN LEACH

ONE of the most valuable applications of the BBC Micro is to make use of its power to communicate with large computers.

It brings to life the concept of distributed processing, where small jobs are done by the micro, but for big jobs, or to read very large files, it links in with the mainframe.

This application may not sound very exciting to the lone home enthusiast, or even a school. But you only have to walk around any university computing department, or one of the many firms with mainframes, to see the BBC Micro used in this way.

How do you communicate with a large computer?

The simple answer is that you connect three wires to the RS423 port and connect these to the mainframe input/output port.

That really is a bit too simple because the vital software element has been omitted.

Lots of articles have appeared during the last couple of years on communication between computers, with associated programs, but very few go far enough to make a particularly valuable contribution to the problem.

Before going on, let's define a few terms.

Mainframe: Any large (greater than 1 megabyte), multiuser, multitasking computer which supports interactive terminals. There is a very blurred distinction these days between a minicomputer and a mainframe, so let's not muddy the issue by considering this argument.

For our purposes the mainframe must be capable of sending asynchronous RS232 protocol Ascii to and from its terminals, and it must use the XON/XOFF protocol, of which more later.

Terminal emulation: First of all, the BBC Micro must be able to emulate the terminals supported by the mainframe. Usually these will be complex devices, with cursor control, highlighted characters, graphics of various kinds and different scrolling modes.

There are many different types of terminal, and each will have its own set of control codes, usually in the form of an Escape sequence – that is Ascii 27 – followed by a mode definition byte, followed by a varying number of bytes according to the specified mode.

Anyone who has programmed graphics on an Epson or similar printer will be familiar with Escape sequences.

One of the most popular terminals for mainframes is the DEC VT100 and its offspring. The BBC Micro is quite capable of emulating nearly all the VT100 features, apart from the 132 character per line screen mode.

Another terminal family widely used in industry is the Tektronix graphics terminal, which can be used for graph plotting and picture drawing in general.

File transfer: While it is very nice to have the BBC Micro used as a cheap but effective spare terminal, this hardly counts as distributed processing.

The vital extra feature is the ability to

APPLICATIONS for the BBC Micro in communications mode are unlimited, but here are a few suggestions:

- *Use a BBC word processor, such as Wordwise or View, at home or in the office to prepare text, and then copy the whole lot over to a professional word processor for quality printing after some reformatting to take advantage of the expensive daisywheel's characteristics.*
- *Use the BBC Micro in the laboratory to collect data off apparatus, over a period of hours or days perhaps. After suitable processing with a BBC program, copy the files generated to the mainframe, where high powered programs can lick the data into shape, or store it on the mainframe's very large filing system.*
- *Use the mainframe to extract data from its files, in a suitable Ascii format, and move that data to the BBC Micro, where it can be displayed, manipulated, reformatted and generally digested, before sending it back to the mainframe.*

This application might be appreciated in busy installations where the mainframe is heavily loaded with many different users.

- *Build up lots of separate data files on many different BBC Micros before sending it all to the mainframe for storage on a database, which could then be examined by the people who provided the data.*

This is a way in which a large organisation, maybe a charity or political party, can get its data computerised by voluntary help without clogging up the central office with tens of thousands of records which would overwhelm limited resources.

Have YOU any suggestions for linking the BBC Micro to a mainframe? If you have any ideas to share with our readers – especially if they have actually been put into practice – send them in.

We will pay £10 for every idea published – and more for detailed descriptions.

The address to write to is:

"Mainframe",
Europa House,
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Stockport SK7 5NY.

transfer files to and from the mainframe, and this is where the problems begin in trying to write suitable software.

Assuming that a disc system is attached to the BBC Micro, the software must ensure that every byte sent by either machine is copied over correctly, and at the same time the process must be stoppable by keyboard interference.

Errors can occur during transmission. The mainframe may for some reason stop sending data for a while, the BBC may develop a disc fault – Disc Full, perhaps – or you may decide that the wrong file is being transmitted anyway and want to halt the process.

During file transfer it is essential that the XON/XOFF protocol is properly observed by the BBC software. This protocol enables two computers to

Don't feed the mainframe garbage

HERE are two short programs to enable your BBC Micro to communicate with a mainframe.

Remember that it is no good writing data to disc file in the normal way with programs like:

```
100 file=OPENOUT("DATFILE")
    .....
200 PRINT#file,VAR1,Z%,TEXT$
    .....
300 CLOSE#file
```

The BBC stores data in a special coded form, such as with strings saved backwards on disc. To see what is going on, just *DUMP a file written in the conventional Basic way.

If such a file is sent to a mainframe it would read garbage. The mainframe requires a pure Ascii file, with text the right way round, and each line of text terminated with a carriage return (&OD).

Fortunately the operating system contains a little known feature which can come to the aid of the hard-pressed programmer.

Ever heard of *FX3,16? Neither had I until I read the Advanced User Guide. This nice feature turns off the spooler.

As everyone knows, a file created with *SPOOL sends all screen/printer output to the named file, including screen prompts and so forth.

Using *FX3,16 you can select just what output you want to go to the disc file, as the following program illustrates:

```
10 REM Creation of an ASCII file
    from a BASIC program
20
30 REM J.M. Leach, 1984
40
50 DIM COMMAND 40
60
70 MODE 7
 80 PRINT ''
 90 INPUT "Enter output file name
     > "F$
100 PROCoscli("SPOOL "+F$)
110 PROCset_spool(FALSE )
120 REM Demo program saves even
     numbers only on file
130
140 FOR I%=1 TO 20
150 IF I% MOD 2=0 OUT%=TRUE
    :Q$="Even"
    :
    ELSE OUT%=FALSE
    :Q$="Odd "
160 PROCset_spool(OUT%)
    : REM Write if even
170 PRINT I%;" ";Q$
180 PROCset_spool(FALSE )
    : REM Turn off spooler uncond
    itionally
190 NEXT
200 PROCoscli("SPOOL ")
210 REM Demonstrate output file
220 PRINT '"Press <RETURN> to see
     file ";F$
230 REPEAT UNTIL GET =13
240 CLS
250 PRINT ''
260 PROCoscli("TYPE "+F$)
270 END
280
290 DEF PROCoscli(text$)
300 $COMMAND=text$
310 X%=COMMAND MOD 256
320 Y%=COMMAND DIV 256
330 CALL &FFF7
340 ENDPROC
350
360 DEF PROCset_spool(logic%)
370 IF logic%=TRUE PROCoscli(
    "FX3,0")
    ELSE PROCoscli("FX3,16")
380 ENDPROC
```

The procedure PROCoscli is provided for those without Basic II. If you have this use the OSCLI command and remove line 50.

The output file could be copied straight to a mainframe and then, preferably, deleted after display.

We now know how to write an Ascii file to disc, ready for transfer to a mainframe.

What about reading the file back in again? Unfortunately BBC Basic has no facility for reading such a file from disc, as it expects the special coded form referred to previously.

However it is quite easy to write a simple routine in Basic or machine code to read such a file and build it into a string, which can be decoded with MID$, VAL, and so on.

Here is a very short Basic version, which will read a file created by the previous program. In practice, of course, the file would have been copied over from the mainframe:

```
 10 REM Function returning string
     from ASCII file
 20
 30 REM J.M. Leach, 1984
 40 MODE 7
    :PRINT ''
 50 INPUT "Enter file name to be
     read > "F$
 60 PRINT
 70 F=OPENUP (F$)
 80 REPEAT
 90 line$=FNread
    :PRINT line$
100 UNTIL EOF #F
110 CLOSE #F
120 END
130
140 DEF FNread
150 LOCAL A$
160 REPEAT
170 Q%=BGET #F
180 IF Q%>=32 AND Q%<=127 A$=A$+
    CHR$ (Q%)
190 UNTIL Q%=13
200 =A$
```

From Page 119

communicate over three wires – data in, data out and ground.

On the BBC Micro the RS423 port also contains the RTS and CTS handshaking lines, which are used when, for example, a serial printer is connected.

If these pins were used in communicating with a mainframe five wires instead of three would be needed, and it would not be possible to make use of a modem.

Connecting the BBC Micro is easy enough, provided one vital thing is done – connect the RTS and CTS pins together inside the DIN plug inserted into the BBC Micro.

If this is not done the whole project will fail and the micro will just hang up.

XOFF means that an Ascii 19 Ctrl S character is sent, which tells the other computer to halt transmission until XON Ascii 17 Ctrl Q is received.

This is essentially a two way process, for typing Ctrl S at the BBC keyboard must make the mainframe stop sending data temporarily, until re-enabled with Ctrl Q. Conversely the mainframe, busy with perhaps dozens of other users, must be able to tell the BBC Micro to shut up for a while.

The mainframe XON/XOFF sequences will be invisible to the user, except perhaps for occasional jerkiness in the terminal display.

However the BBC Micro file system is very slow compared with mainframe systems, which can write to files at megabytes per second. So when a block is to be written locally, the mainframe must be prevented from sending any more information, as otherwise the RS423 input buffer will fill up.

From what has been said already – and that unfortunately is not the full story – the reader may be left wondering what the point of this article is, if there are so many pitfalls to be avoided.

Well the simple answer is, go and buy a chip!

As the usefulness of terminal emulation and file transfer was recognised some time ago, lots of people have achieved the objective, and there is quite a wide choice of sideways eproms available.

Computer Concepts, for example, have produced Termi, a fairly unsophisticated program, and Communicator, which emulates the VT100, but can be tailored to suit other terminal types.

Pace have produced Commstar, which additionally gives teletext displays and will link into Micronet. Several university computing departments, such as Bristol, Bath and Sussex, have written eproms.

Workstation, from the University of Sussex, is the only one with which I have had personal experience. It behaves faultlessly when connected to a Vax computer, allowing terminal emulation both as a VT52 terminal (a less sophisticated VT100), a Tektronix graphics terminal, and a disc file to mainframe two way transfer facility.

An extra goody is a screen dump to Epson printer routine, when in Tektronix mode. This works fine, if rather slowly.

In VT52 mode it supports all the DEC EDT screen editor function keys. This statement may not mean much to non-DEC users, but there are a lot of them about.

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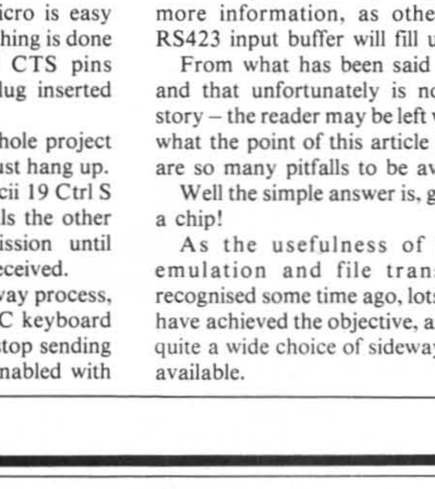

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How many times have you wanted to get a copy of a program to a friend or a business colleague, quickly? With Commstar you can transfer a file of ANY type, between two BBC's (which may be thousands of miles apart), in the space of a phone call.

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Commstar is 'intelligent'. It offers many advanced features to ensure simple and effective communication with the remote system.

Consider the following features.

Prestel Mode

Prestel mode features full colour Prestel graphics including double height and flashing characters. Full Telesoftware capability is offered allowing the many free programs offered by Micronet 800 to be downloaded into your computer. Pages of particular interest may be 'marked' for later retrieval and display. Page images may be copied and saved to a file on the current filing system.

Terminal Mode

In terminal mode all input may be copied into a buffer in memory or spooled directly on to disc. Full control over buffered data is provided allowing it to be listed to screen or printer, sent to the RS423, saved to or loaded from the current filing system (including TAPE).

Commstar allows full configuration and easy control over the protocols used. Send and receive baud rates, word length, parity and number of stop bits are selected from a simple table of options.

When in chat mode (80 or 40 column), characters transmitted by the host will be displayed on the BBC screen and characters typed on the BBC will be sent to the host.

Commstar allows ANY type of file (not just ASCII) to be transferred 'safely' using XMODEM protocols. In fact, four individual methods of transmission are provided for within Commstar giving great flexibility.

Using a disk based 'emulation file' Commstar can be configured to emulate virtually any terminal type including VT100, within the capabilities of the BBC.

In addition to the above, most MOS commands can be executed from within Commstar, errors are trapped by Commstar's own error-handling routines and an optional elapsed time clock may be displayed. Data filter, Local Echo, Auto-line-feed, printer on/off and XON/XOFF protocols may be toggled in or out by a single key press, extensive use being made of the function keys.

Finally, Commstar may be fitted into any of the sideways ROM sockets and is provided with a comprehensive manual.

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This package contains the *Toolstar* firmware in Eprom and a very comprehensive manual (over 150 pages), containing many examples and illustrations to help you make the best use of *Toolstar's* exciting capabilities.

Toolstar sheds new light on your BBC micro

Toolstar, being Eprom-based will be permanently resident in your computer allowing all of its commands to be immediately available. It is 'transparent' to both the user and the operating system; once a command has been executed, control is returned to Basic, or whichever ROM had control prior to the command.

Full error handling has been incorporated and for new users there are full help menus describing each command and its syntax.

Powerful building blocks for Basic programmers?

Within *Toolstar* there are 22 commands, 8 of which operate between PAGE and TOP ie. on the current Basic program or Basic programming environment. These commands obey standard Basic command syntax rules.

Reveal the deepest secrets of your discs

Toolstar allows the operations of Formatting, Verifying, reading or writing a disc sector to be carried out very simply from Basic i.e. all the necessary building blocks required to develop a comprehensive set of disc utilities, simply and effectively.

Lost your memory? – No more amnesia with Toolstar!

In addition to the commands described above there are 9 commands which operate on the whole of the BBC's memory and are designed to complement the BBC's built-in assembler. These include a full feature dissassembler and memory dump, each with forward and reverse scrolling.

If this is not enough *Toolstar* can be Extended!

There are three help menus on Toolstar which may be obtained by typing HELP TOOLS, *HELP MCODE or *HELP EXTEND. The third option menu will intially display the following

```
*HELP EXTEND
EXTEND <RAM adds>
```

i.e. typing *EXTEND <address> will allow the user to extend the facilities of *Toolstar* with routines which are supplied by himself. The manual describes fully how this operation is carried out and illustrates it with several examples.

In the future such utilities will be made available on disc and cassette from Pace, thus allowing a comprehensive library of utility programs to be built-up.

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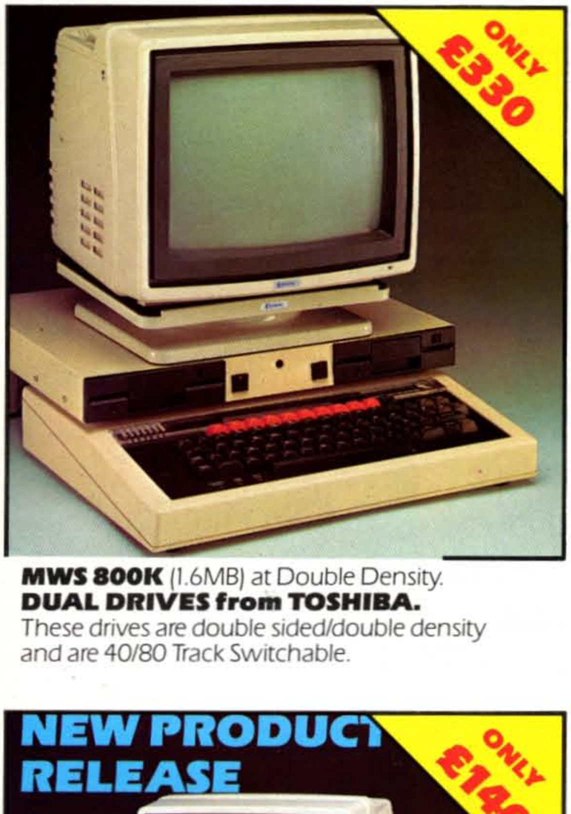

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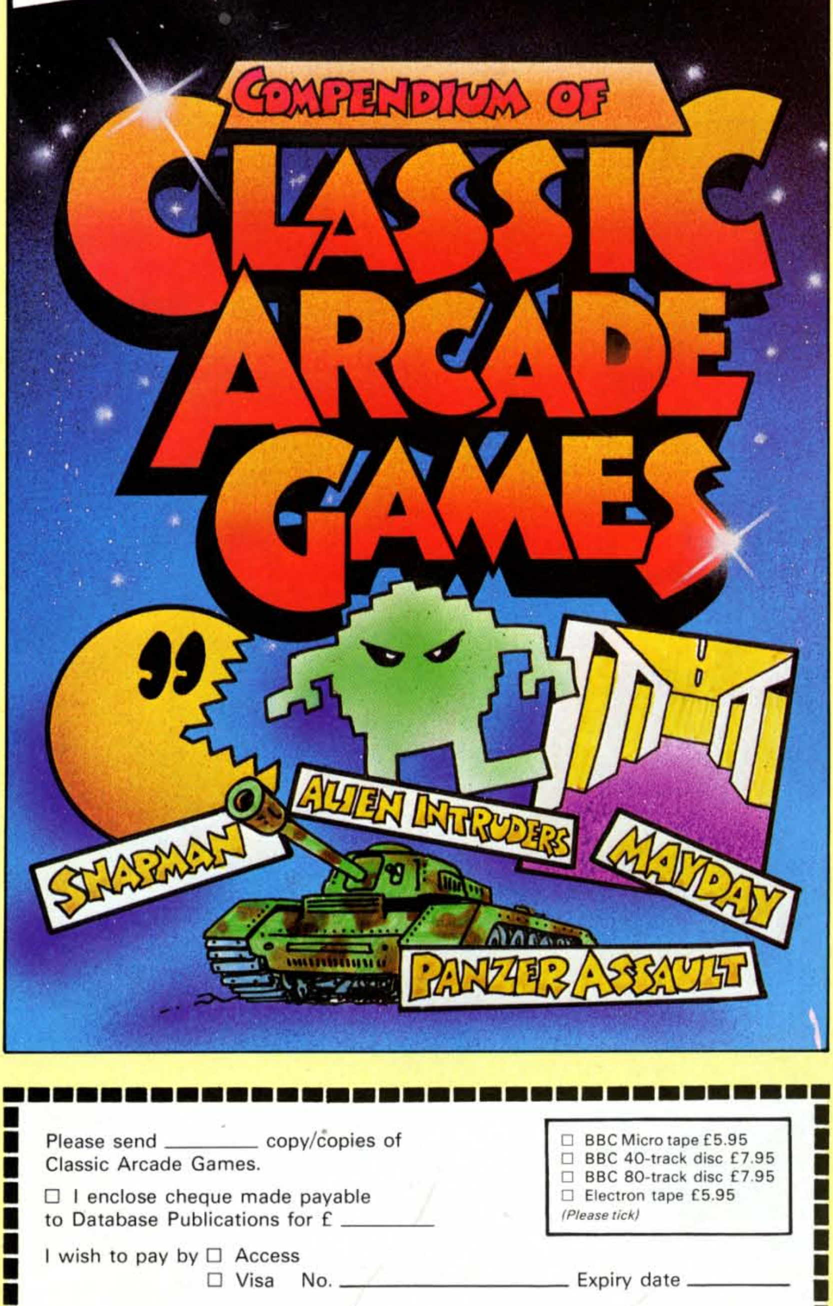

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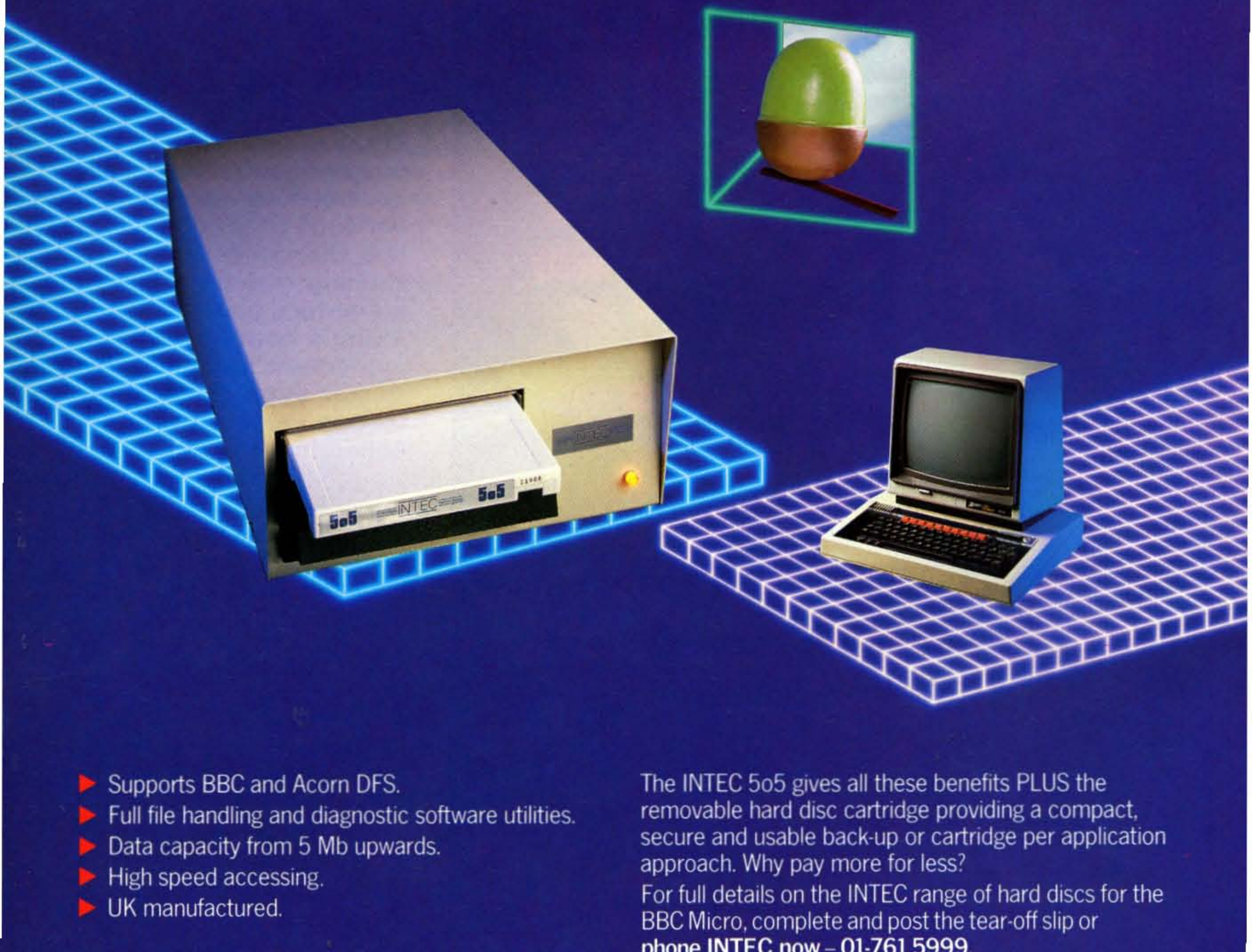

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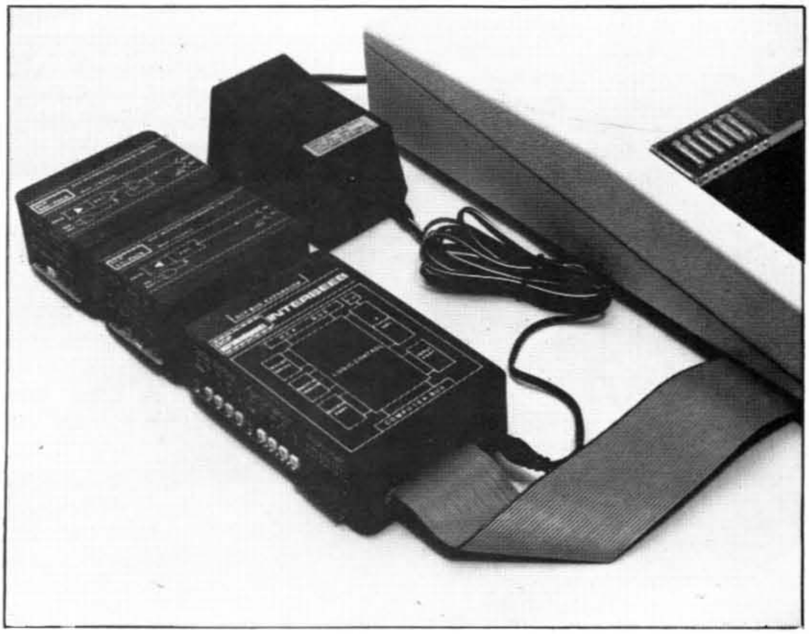

Get more out of (and into) your micro with a little black box

Interbeeb ***DCP Microdevelopments***

IT is true to say that no matter how many inputs and outputs you provide on a computer somebody will always want more. Fortunately there seems no shortage of those willing to provide them.

One neat idea comes from DCP Microdevelopments and is called Interbeeb. It is a black box which plugs into the 1MHz bus and allows a wide variety of input/output types.

The box measuring 3in x 4½in is covered on all sides with a variety of sockets allowing all sorts of devices to be connected into your micro.

To begin with there is an 8 bit digital input port and a ditto output port. Both are mapped to the same address on the 1MHz bus so that to output a byte you simply write to the address (using ?&FCC2=A%). To see what is on the inputs simply read the address, using A%=?&FCC2.

Note that the eight bits on the user port can be either inputs *or* outputs, but with this device you have eight of each.

Next are four switched inputs. These are very similar to the eight digital inputs except they are pulled down internally and so need switching to 5 volts to register their value.

Moving along the side of the box there are four relay outputs. They make a small clicking noise as they pull in. All the relay contacts are rated at 12 volts at 1 amp.

A single contact is brought out on the box for each relay and a single common connection, thus the loads switched by the relay must have a common connection.

They cannot be independent, although you could easily unscrew the lid and wire the relay contacts separately.

Along the other side of the box are eight analogue inputs. These are connected to a single 8 bit analogue-to-digital converter. You first need to select a channel to convert and then you can read the results.

As conversion time is about 0.1 milliseconds you can read the result in the next line of Basic. As it is 8 bits it will return a value between 0 and 255 for voltages from 0 to 2.45 volts (+/− 5%).

If you are really cunning you could scan each channel as part of the interrupt service routine just like the analogue input on the BBC Micro.

Finally, along the top side is the DCP bus socket. This allows extra modules to be connected end-to-end in domino fashion. Two of these extra modules were also loaned for this review – a fast analogue/digital converter and a digital/analogue converter.

The A/D converter, unlike the one in the main box, has a single input, but like the other one also has 8 bits resolution. However it is much faster and can perform the conversion in about 10 microseconds – 10 times faster than the main box.

However like the box there is no way of telling when the conversion process has finished. This is no problem with a Basic program but in machine code you will just have to experiment to find exactly how long you have to hang about before the result is ready.

The D/A converter will produce an analogue signal in approximately 10 millivolt steps. This means that if you store 100 at its address location you will get a 1 volt output.

A nice touch is that all the modules have labels on the top with a diagram of the function of the module enabling you to better appreciate what is going on inside.

All the modules are powered from a separate calculator type mains adaptor capable of producing 500mA. The Interbeeb is at a fixed address on the 1MHz bus (&FCC0 to &FCC4) and so only one may be connected to the machine at any one time.

The plugs and sockets needed to make the connections to the boxes are not provided, but are standard and

→

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should not be difficult to get hold of.

The documentation, described as provisional, was a little sketchy but contained all the relevant facts and a few simple Basic examples of how to access each device.

If you are looking for a simple way to connect more into your Beeb then the Interbeeb might be just what you are looking for.

Mike Cook

Suntan for chips?

Uvipac eprom eraser *Ground Control*

PERHAPS the current interest in eprom programmers is because many people are developing ROM-based software. If you are one of them, before long you are sure to need an eprom eraser – unless, that is, you never make any mistakes.

The trouble is that most erasers seem to cost more than you would wish, for after all they are just an ultraviolet lamp. Or, as I would have it, an ultra violent lamp.

However most commercial products do have built-in timers to control the degree of suntan you give your chips, as well as safety devices to prevent any harmful rays assailing your eye balls. This quite naturally increases the cost and puts them out of reach for hobby applications.

Now Ground Control has come up with a stripped down version at a stripped down price – a small black box just over 3in square.

On one side is a small flap that can be raised to accommodate three eproms. The unit then plugs in the mains and 20 minutes later your eproms have more than a touch of instant amnesia.

The unit did work but the conducting foam carrier keeping the eproms in place had the habit of getting jammed inside. Also there was no indication of whether the unit was actually on apart from it getting hot.

If you are going to use it occasionally then it is perfectly adequate for the job. But if you want to erase any number of eproms on a regular basis then you will just have to cough up the extra money.

Mike Cook

Monitor

WHAT exactly are machine code monitors, and how can they help us program? Here JIM NOTMAN assesses two of the latest ROM based monitors.

AFTER getting to know Basic many will want to learn how to write 6502 machine code using the assembler built into Basic. This may be just to write fast or specialised routines to add to Basic programs, or possibly programs that are written completely in machine code.

Unfortunately once you've written the code and had it assembled it's not as easy as Basic to debug if it doesn't work as expected. Basic has the great advantage of having many informative error messages to help with debugging – messages that are not given in machine code – unless you write them yourself.

This is where a machine code monitor helps. With this software tool you should be able to run a machine code program, checking what effect the code has by going through the code one step at a time (single stepping), showing the contents of the registers and status flag. This is an especially important facility for beginners, who often have difficulty with the settings of the status flags.

Beebmon *Watford Electronics*

AFTER starting up Beebmon by typing in *MONITOR, Mode 7 is selected and a little command strip is displayed along with a command request.

These commands fall into two types – those concerned with memory display and modification and those with program execution.

The memory display and modification commands include disassembly of code, hex and Ascii dump of memory. The cursor keys control the position of the cursor, allowing scrolling both upwards and downwards, and the place where editing takes place, simply by overtyping previous values.

Then editing the disassembly allows it to be used as a simple assembler.

Memory tasks include:

☐ *Fill a block of memory with a specific value.*

☐ *Give the Checksum of a memory block.*

☐ *Move memory.*

☐ *Relocate memory. This alters code to act as if it were at a different address.*

☐ *Search memory for a string or series of bytes. Send a * command for any operating system call.*

Inputting the commands was easy and clear, simply by pressing one or two letters without the need to press Return. Other details, such as a start address, would then be requested. The cursor can be moved left and right within an input field by the cursor keys so that mistakes can be corrected.

The simplest way of seeing what the monitor will do is to look at a screen of output from a short piece of code which transferred the screen memory *(see Figure I)* into another area of RAM before being *SAVEd.

As you would expect on a machine code monitor the registers can be individually set before debugging.

As seen in Figure I up to nine columns of information are given. The seven left hand columns are what you expect a monitor to have with the current location, disassembly of code and the contents of the registers. The two right hand columns give the address of the operand and its contents – very useful with machine code which uses much in the way of indexed or indirect addressing.

The bottom row contains the values of the registers, including the separate flags that make up the status register.

Instead of single stepping, sections of code can be emulated. This is where breakpoints are needed. They can be placed in any position you want to halt the program and examine the registers.

In Beebmon these breakpoints are used in a far more flexible way than in the majority of monitors. This is because a table is referred to before each step of program execution, so that breakpoints can be set, even in ROM.

Conditions can be attached to the

your machine code program's progress

breakpoint, for example to cause a break when the accumulator or X or Y registers has a particular value or when a location is being written to.

The single stepping and emulation can be used with any page ROM as well as RAM. Even Beebmon can be examined in this way.

Trace limits can be set, so that only code between given addresses are shown, avoiding displaying calls that are made outside the code you are interested in.

Much of the screen output can be directed to either the printer or a file on the currently selected filing system. This is necessary when debugging routines where the screen must not be disturbed.

One page of memory is reserved as workspace, normally at &0400, but this can be moved if page &4 is needed. A short 19 page spiral bound manual details all the commands and some examples of use.

Watford Electronics are honest enough to include a section on what their software cannot do, mainly emulating interrupts and storing the VDU queue, which are rather complex and specialised pursuits.

This machine code monitor is simple to use yet powerful in operation. It should appeal both to the beginner who will want to see how machine code works and to more experienced hacks who want a good debugging facility.

Gremlin *Computer Concepts*

ALTHOUGH this is also described as a monitor and debugging aid, it could hardly be more different from Beebmon. It's not the sort of package you can jump into without first painstakingly going through the manual.

When Gremlin is entered it stays in the currently selected screen mode. A large amount of information is printed on the screen in 40 and 80 column modes, as part of the 'status display' *(Figure II)*.

The top row shows the contents of the accumulator, X and Y registers along with the individual flags of the status register. The second row gives the stack pointer plus the bytes that are being pointed to. Similarly the third row gives the program counter plus a number of bytes that are pointed to.

The next line will disassemble the code at the program counter or print ??? if it is not a valid code. The remaining lines give a hex dump with Ascii equivalents of memory pointed to by a variable called $M.

Gremlin is characterised by a number of system variables. Rather than have a command to set, for example, the X register, it will want to have the variable $X set to the required value.

Apart from commands concerned with memory manipulation and program execution, this package has an assembler and an extensive expression evaluator.

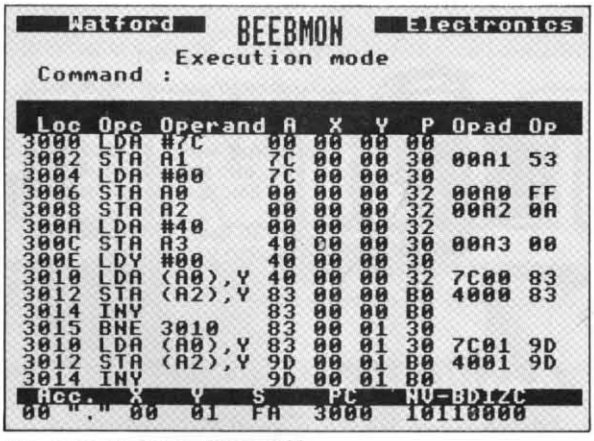
First, a look at some of the memory manipulation commands:

The memory of the status display, pointed to by $M, can be edited by punching in data, in bytes, words, strings or even an assembly statement.

The memory pointer can be altered by an expression like $M=3000 or by adding or subtracting a value from the pointer with + and −.

There are other commands for searching for data, moving data, tabulating memory (in hex and Ascii)

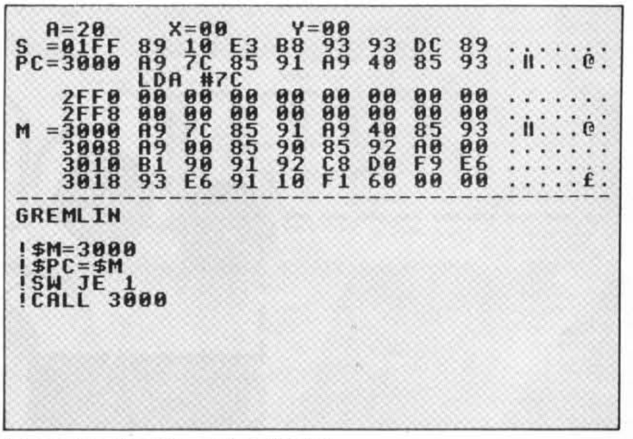
→



```
   Watford     BEEBMON    Electronics
          Execution mode
 Command :

 Loc  Opc Operand A  X  Y  P  Opad Op
3000 LDA #7C     00 00 00 00
3002 STA A1      7C 00 00 30 00A1 53
3004 LDA #00     7C 00 00 30
3006 STA A0      00 00 00 32 00A0 FF
3008 STA A2      00 00 00 32 00A2 0A
300A LDA #40     00 00 00 32
300C STA A3      40 00 00 30 00A3 00
300E LDY #00     40 00 00 30
3010 LDA (A0),Y  40 00 00 32 7C00 83
3012 STA (A2),Y  83 00 00 B0 4000 83
3014 INY         83 00 00 B0
3015 BNE 3010    83 00 01 30
3010 LDA (A0),Y  83 00 01 30 7C01 9D
3012 STA (A2),Y  9D 00 01 B0 4001 9D
3014 INY         9D 00 01 B0
 Acc.    X   Y   S    PC   NV-BDIZC
00 "."  00  01  FA  3000  10110000
```

Figure I: Beebmon disassembly



```
  A=20     X=00     Y=00
S =01FF 89 10 E3 B8 93 93 DC 89 ........
PC=3000 A9 7C 85 91 A9 40 85 93 .‖...@..
        LDA #7C
   2FF0 00 00 00 00 00 00 00 00 ........
   2FF8 00 00 00 00 00 00 00 00 ........
M =3000 A9 7C 85 91 A9 40 85 93 .‖...@..
   3008 A9 00 85 90 85 92 A0 00 ........
   3010 B1 90 91 92 C8 D0 F9 E6 ........
   3018 93 E6 91 10 F1 60 00 00 .....£..
----------------------------------------
GREMLIN

!$M=3000
!$PC=$M
!SW JE 1
!CALL 3000
```

Figure II: Gremlin status display

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and disassembly.

Code can execute by single stepping, with breakpoints or by a call. As you would expect all the registers can be set individually. When setting the X register, for example, you will be aware of the difference between = and ==. The == only expects one byte as in $X==10, only altering the X register. The = expects two bytes.

If the X register is assigned two bytes, as in $X=3080, the X and Y registers are treated as a pair so that the least significant byte is placed in the X register and the most significant in the Y register.

Apart from RAM, paged ROMs can be single stepped. These ROMs are selected with $ROM.

Limits can be set on the code that is to be debugged, so avoiding display of code outside those limits. Output can be sent to a printer or a file so that graphics routines can be debugged.

Breakpoints can be set, but only in RAM, not in ROM or even in RAM in a sideways ROM socket. They do not have conditions attributed to them like Beebmon's.

Gremlin has a full assembler capable of single or two pass assembly. Short routines can easily be typed in directly, but probably it is best to use a text editor to write the assembler program. Not surprisingly Wordwise is suggested! There are some differences compared with Basic and these are documented in the manual.

As I said, the expression evaluator is very extensive, being based on the language C. There is a command PRINT to print out the results of the expressions.

The operators + − * / for add, subtract, multiply and divide will be familiar to Basic users.

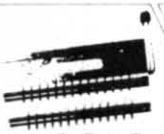
There are however a number of other symbols which will not be so familiar. Like &, which performs a bit-wise AND, and % which performs a MOD.

Something new to Basic users will be << and >>, which do a bit shift left and bit shift right, for example PRINT value>>1 will printout value with its bit pattern shifted 1 bit to the right, which in binary arithmetic divides by 2. A more useful operator than you first think.

As well as system variables you can use your own variable names. As with Basic they may be up to 254 bytes long, with all characters both upper and lower case being significant.

This is a flexible and powerful package. A 32 page spiral bound manual gives all the commands with examples of how they may be used. Strangely, coming from a company which is best known for Wordwise, a piece of software which is simple and easy to use, this is complex and will take some time to know. But it does have a large number of facilities.

OK for the expert, but not really for the beginner in machine code programming.



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Rollerball

By GEOFF TURNER

REMEMBER those little plastic maze toys containing several ball bearings? By tilting the maze in various directions, it was possible to steer the balls into the central section of the maze.

Of course it's quite easy to get one or even two balls into the centre, but they soon find their way out again if you tilt in the wrong direction.

Here is a program which simulates one of these toys. It even gives you the option of choosing how many balls you wish to use.

If you find the game too easy, using the invisible maze should soon bring you down to earth!

Complete instructions for playing the game are contained in the program listing.

Here's how it works:

A short machine code program is assembled at lines 100 to 190. This is used to assist in the continuous flow of music while the game is being played.

It is necessary to check the status of the sound buffer to see if room is available to add more notes to the queue.

The machine code is called in PROCMUSIC at line 3140.

Two procedures are used to initialise the variables. PROCINIT1 sets those variables which only require initialising at the start of the game. PROCINIT2 initialises variables which need to be reset after every game.

These procedures are called at lines 210, 220, followed by a call to PROCINSTRUCTIONS, which displays a description of the game and the playing instructions.

A large chunk of the program is taken up by the procedure to set up the screen display between lines 500 and 1440.

Basically a number of green squares are drawn on the screen starting with the maximum size, and reducing each one by 64 pixels.

The final square is drawn in yellow to show up if the option to use an invisible maze is taken.

The data in lines 1710 to 1880 is then used to develop the squares into a maze by closing off certain sections and making gaps at various points in the squares.

Also in PROCSCREEN the arrows to indicate direction of tilt are drawn and the elapsed time clock is printed.

The main loop of the program is fairly short, simply moving the balls in the current direction of tilt.

The main loop procedure also checks to see if any keys are being pressed to request a change of direction.

Note that *FX11,0 is used to disable the key repeat facility, so it is pointless holding down a particular key.

As the balls move around the maze it is necessary to perform a lot of checking using the POINT command to see if each ball has hit a wall or another ball.

PROCCHECK is therefore called from within the main loop before the balls are moved to their next position. Having decided the direction of the balls, it is necessary to check no less than eight points around the ball.

Unfortunately all this checking does tend to slow the balls down a little, so I have compacted the main loop procedure into multi statement lines where possible to help keep the speed up.

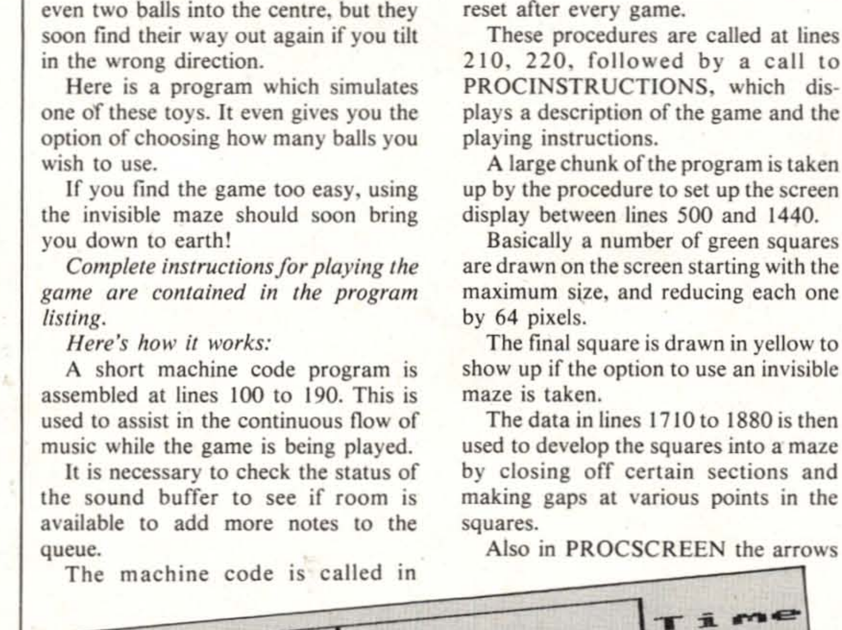
A further important check is necessary after each movement of the balls to see if they have all entered the central square. PROCWIN is used to carry out this check.

Note that if any ball is found to be outside the centre then the procedure is terminated without checking the other balls.

If PROCWIN returns E%=1 then the mainloop is terminated and a suitable comment is made depending on the value of T% from PROCTIME.

The data in lines 3110 to 3130 are the notes used in PROCMUSIC to produce an accompaniment to the game.

Users with a disc interface fitted may have a memory problem. It will be necessary to lower PAGE before running the program, or use a downloader routine.



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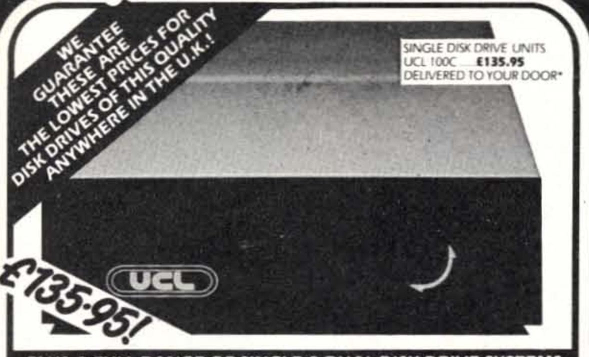
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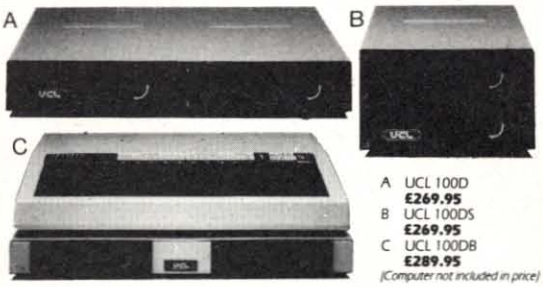

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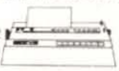

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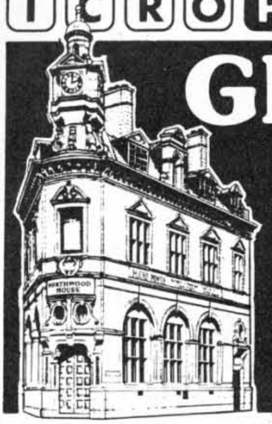

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THE BEEB BODY BUILDING COURSE

Tune in to a digital frequency meter

Part 18

I HAVE had several letters from readers wanting to find some way to tune their guitars using the BBC Micro. This sounded a strange request at first and so I discussed it with the editor.

He must be a little more wily than we give him credit for, because he said the one thing guaranteed to make me tackle a project: "So you can't do it then?" Thus galvanised, I set out to see how it could be done.

The solution is to make the computer into a digital frequency meter. This is useful, not only for tuning instruments, but for all sorts of measurements such as hi-fi and general laboratory work.

I remember when I first went to work after leaving school, the pride and joy of the electronics lab was a digital frequency meter. It had a neon display that would "spin" and then briefly display the frequency before spinning around again.

At the time it cost the equivalent of a new Mini Cooper, but then electronics were expensive in 19** (Blast, I must get this printer fixed).

The repetitive nature of the electronics needed for a frequency meter were ideally suited to implementation with integrated circuits, and before long it was possible to buy one on a single chip.

When setting out to convert the computer I initially thought of converting the signal into a DC voltage proportional to the frequency and then measuring it using the analogue input port. This only goes to show how wrong initial thoughts can be. It would have been quite inaccurate and required a fair bit of electronics to achieve.

The frequency of a signal is the number of cycles it goes through in one second. In the good old days this was measured in cps (units of cycles per second).

However when we joined the Common Market this was all too simple for the French, and so the units of frequency were changed to Hertz, after a German physicist and part time renter of cars. The strange thing is that one Hz (Hertz) is defined as one cycle per second. Still, that's progress!

There are two methods of measuring frequency. First you can count how many cycles there are in a second, and secondly you can time how long it takes for one cycle and work out how many there would be in a second.

Both methods are possible using the computer, and they can be implemented in several ways. The best is to use the facilities of the VIA (Versatile Interface Adaptor) which can be accessed from the user port.

By MIKE COOK

The VIA contains two timers which can be used to measure frequency while the computer is getting on with something else. As we have not yet used these timers in earlier projects, it will be in order to say a little about them.

They are imaginatively called Timer 1 and Timer 2 and while they do similar jobs, they are not identical.

Timer 1 consists of two memory locations within the VIA (&FE64 and &FE65). These form a 16 bit number that is decremented every clock cycle.

As these memory locations are accessed at the same speed as the 1MHz bus, the number will be decremented once every 1uS. This happens automatically without the need for program intervention.

When these locations reach zero the VIA can generate an interrupt and a new number can be loaded in from Timer 1's latch register automatically.

The latch register (&FE&6 and &FE67) is a sort of store used to remember the time interval you want Timer 1 to use repeatedly. I say "can" because the timer can run in several different "modes" and these events will only occur if you have selected them.

The mode is determined by the bit pattern in the auxiliary control register (&FE6C). This location also controls the behaviour of Timer 2. The only reason why this may appear to be complicated is that, despite there being only a few events that can or can not happen, the number of combinations of events is large (256 combinations).

In addition to this, bit 7 of the B side of the User Port can be made to produce an output that changes with the state of the timer.

So this bit, along with the timer, may work continuously producing a square wave output whose period is twice that of Timer 1.

Alternatively, if the option not to reload the timers is chosen, it can produce a "single shot" pulse which lasts for the time given by Timer 1.

Timer 2 can operate in this same single shot mode, only using locations &FE68 and &FE69 to determine the time. There is no latch register for this timer and so it cannot be used on a continuous basis. Also no output is available (like bit 7 for Timer 1) to indicate the state of the timer.

It does however have one big advantage over Timer 1 in that it can be used as a counter. Instead of taking the computer's 1MHz E signal as the command to decrement a counter it can be programmed to use a signal that is fed into the VIA through bit 6 of the User Port.

So this timer can count external events and cause an interrupt after a predetermined number without any program intervention.

The VIA also contains a shift register controlled from the auxiliary control

→

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register, but as this is not needed here we will leave explanation of its operation for another day.

Figure I shows how the bits in this register control the operation of the two timers. Armed with this information we can see one method of measuring frequency.

If the signal we want to check is fed into bit 6 on the user port we can count every cycle that is made. This in itself will not give us a measure of frequency. What we need to do is to count how many cycles have occurred in a unit of time. This unit of time can be specified by Timer 1.

In addition, we can use the bit 7 output from Timer 1 to "gate" the signals going into Timer 2. Thus Timer 2 is only decremented while Timer 1 is counting.

The procedure is therefore to set Timer 2 to the maximum value, start Timer 1 going, and when it is timed out look at the value in Timer 2. This will tell us how many cycles it has received during the timer of Timer 1.

As you are doing this by computer it can then do the "sums" to extract the frequency in cycles per second, sorry Hertz.

The only thing that needs to be added to the computer is the device that lets pulses through to Timer 2 while Timer 1 is going. This turns out to be simplicity itself. Figure 2 shows how it is done. Surprised?

The signal to be measured is applied to the input and this turns the transistor on and off in time with the signal. However when bit 7 is high bit 6 will remain high as there is nothing to pull it down.

Only when bit 7 is low can the transistor switching on and off make the signal on bit 6 go high and low. Thus the circuit acts as a gate and only lets pulses through during the period defined by Timer 1.

The signal must be large enough to turn the transistor on. Anything greater than about 1 volt will work.

A program to measure frequency in this way is given in Listing I. The section to start the measuring operation is in machine code although it would work equally well in Basic.

I have tucked it away in the RS232 buffer, but it can be moved anywhere to suit your own requirements.

Timer 1 is set to the maximum time of 64mS to allow as many pulses as possible to be counted. Thus, 64mS after the call to the subroutine is made the number of cycles counted is waiting for us in Timer 2's counter (&EF68 and &FE69).

As the input decrements the count rather than increments it what we actually have is our initial number, minus the number of cycles we have had. This is calculated in lines 280 to 310. The result is then printed on the screen and the program loops round to measure the frequency again.

As Timer 2 only counts edges the number of pulses counted must be a whole number. This means that the count could be up to one count short. When this is multiplied up to find out how many pulses would have occurred in one second the result can be up to 16Hz in error. This is a constant and represents the resolution of the measurement.

Thus the percentage accuracy will be quite high for high frequencies (approaching 1MHz) and very low for frequencies below 100Hz. This is a factor of the "gate time" which, in our case, is 64mS.

If you want to measure really low frequencies accurately then you need a longer gate time. This cannot be achieved using Timer 1 but can be done using the computer's event timer. This allows an event routine to be called at intervals you can specify from the keyboard. The program will accept any

```
   10 REM FREQUENCY COUNTER/TIMER
   20 FOR A%=0 TO 3 STEP 3
   30 P%=&A00
   40 [
   50 OPT A%
   60 .SETUP
   70 LDA #&A0 \T1 ONE-SHOT T2 COUNTD
OWN
   80 STA &FE6B \AUX CONTROL REG
   90 LDA #&FF
  100 STA &FE68 \T2 INITIAL VALUE
  110 STA &FE69
  120 STA &FE64 \T1 LOW ORDER
  130 STA &FE65 \T1 HI ORDER
  140 RTS
  150 ]
  160 NEXT
  170 CLS
  180 PRINT"BEEB BODY BUILDING COURSE"
  190 PRINT"FREQUENCY METER No. 1"
  200 PRINT"By Mike Cook"
  210 PRINT
  220 PRINT"Counting the number of cy
cles in 64mS"
  230 REPEAT
  240 CALL SETUP
  250 TIME=0
  260 REPEAT
  270 UNTIL TIME >8
  280 A%=?&FE68
  290 B%=?&FE69
  300 C%=&FFFF-(A%+B%*256)
  310 F%=INT(C%/.064)
  320 PRINT TAB(0,13);"COUNT =";C%;SP
C(8)
  330 PRINT "FREQUENCY =";F%;"Hz";SPC
(8)
  340 UNTIL FALSE
```

Listing I

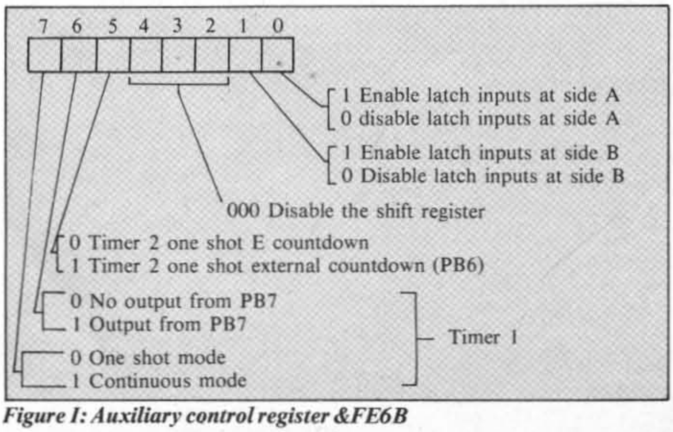
7 6 5 4 3 2 1 0
1 Enable latch inputs at side A
0 disable latch inputs at side A
1 Enable latch inputs at side B
0 Disable latch inputs at side B
000 Disable the shift register
0 Timer 2 one shot E countdown
1 Timer 2 one shot external countdown (PB6)
0 No output from PB7
1 Output from PB7
0 One shot mode
1 Continuous mode
Timer 1

Figure I: Auxiliary control register &FE6B

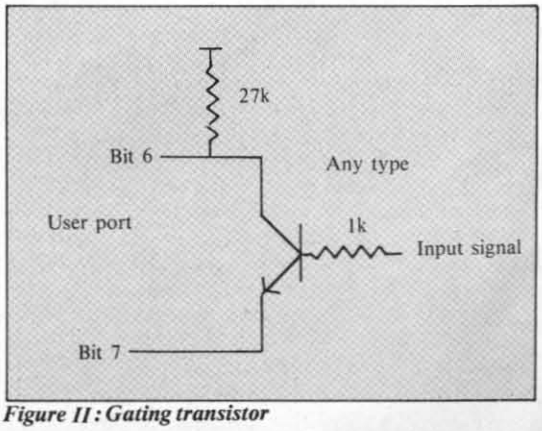

Figure II: Gating transistor

time greater than 0.06 seconds.

The event routine records the number left in Timer 2 in memory locations &7D and &7E and re-initialises the event timer. Listing II show how this can be done.

You can specify the gate time you require and get the corresponding level of accuracy. Bear in mind the total number of pulses received in the gate time must not be greater than 65,535 (&FFFF) otherwise Timer 2 will "wrap round" and start again.

Also when measuring really low frequencies (less than 10Hz) make sure that you have a good rise time on the signal. While testing I discovered that only a square wave output from my signal generator gave a reliable result.

If you want to use low frequency sine waves you will have to square them up using a Schmitt trigger or saturating amplifier. In fact this program will work as an automatic background task even after you have pressed the Escape key.

To stop it totally you need to type *FX13,5 or hit the Break key. This means that measurements can be taking place while the computer is doing something else. However it is relatively slow and requires many cycles to determine the frequency.

The result is that if the signal you are trying to measure changes frequency in the course of measurement you will get an average frequency recorded. To prevent this you need to measure the

→

```
   10 REM FREQUENCY COUNTER/TIMER 1a
   20 *FX13,5
   30 ?&FE62=&80
   40 ?&FE6B=&20
   50 FOR A%=0 TO 3 STEP 3
   60 P%=&A00
   70 [
   80 OPT A%
   90 .CSTART \ASSUME IT IS OUR EVENT
  100 LDA #&80
  110 STA &FE60 \CLOSE GATE
  120 LDA &FE68 \STORE COUNTER VALUE
  130 STA &7D
  140 LDA &FE69
  150 STA &7E
  160 LDA #&FF \RESET COUNTER
  170 STA &FE68
  180 STA &FE69
  190 LDX #&80 \POINT TO TIME VARIABL
E
  200 LDY #0
  210 LDA #4 \EVENT TIMER WRITE
  220 JSR &FFF1 \OSWORD ROUTINE
  230 LDA #&1
  240 STA &7F \INDICATE NEW READING
  250 LDA #0
  260 STA &FE60 \OPEN GATE
  270 RTS
  280 ]
  290 NEXT
  300 CLS
  310 PRINT"BEEB BODY BUILDING COURSE
"
  320 PRINT"FREQUENCY METER No. 1 a"
  330 PRINT"By Mike Cook"
  340 PRINT
  350 REPEAT
  360 INPUT"Enter the GATE time secon
ds ",G
  370 G%=G*100
  380 UNTIL G%>6
  390 PRINT"Counting the number of cy
cles in ";G%*10;"mS"
  400 ?&220=CSTART MOD 256
  410 ?&221=CSTART DIV 256
  420 ?&84=&FF
  430 !&80=-G%
  440 A%=5
  450 CALL CSTART
  460 *FX14,5
  470 REPEAT
  480 ?&7F=0
  490 REPEAT
  500 UNTIL ?&7F=1
  510 A%=?&7D
  520 B%=?&7E
  530 C%=&FFFF-(A%+B%*256)
  540 F%=INT(C%/(G%/100))
  550 PRINT TAB(0,13);"COUNT =";C%;SP
C(8)
  560 PRINT "FREQUENCY =";F%;"Hz";SPC
(8)
  570 UNTIL FALSE
```

Listing II

```
   10 REM FREQUENCY TIMER 2
   20 FOR A%=0 TO 3 STEP 3
   30 P%=&A00
   40 [
   50 OPT A%
   60 .FREQ
   70 SEI
   80 LDX #&FF
   90 LDA #0
  100 STA &FE60 \OPEN THE GATE
  110 JSR TRANSITION
  120 STX &FE64
  130 STX &FE65 \ START TIMER
  140 JSR TRANSITION
  150 LDX &FE64
  160 LDY &FE65 \GET COUNTER VALUES
  170 STX &80
  180 STY &81
  190 LDA #&80
  200 STA &FE60
  210 CLI
  220 RTS
  230 .TRANSITION
  240 LDA #&80
  250 .LOOP1
  260 BIT &FE60
  270 BVC LOOP1
  280 .LOOP2
  290 BIT &FE60
  300 BVS LOOP2
  310 RTS
  320 ]
  330 NEXT
  340 CLS
  350 PRINT"BEEB BODY BUILDING COURSE
"
  360 PRINT"FREQUENCY METER METHOD 2"
  370 PRINT"By Mike Cook"
  380 PRINT
  390 PRINT"Timing one cycle 1 mS res
olution"
  400 ?&FE62=&80
  410 ?&FE6B=0
  420 CALL &A00
  430 A%=&FFFF-(?&80+?&81*&100)
  440 PRINT TAB(0,13);"TIME IS ";A%;"
 MICROSECONDS";SPC(8)
  450 F=INT((1/A%)*1E06)
  460 PRINT "FREQUENCY IS ";F;" Hz";S
PC(8)
  470 GOTO 420
```

Listing III

From Page 139

THE BEEB BODY BUILDING COURSE

time period of one cycle and then work out how many of these will fit into one second.

This can be done with a machine code routine as show in Listing III. It first opens the gate and waits until a transition of the input (bit 6) has been detected. Then Timer 1 is started and on the next transition the number left in Timer 1 is a measure of how long it took.

However, even in machine code there will have been some time delay between the transition and starting the timer, but this is compensated for, as approximately the same time delay exists between the transition and reading the timer. As the computer normally runs under continual interrupts these have to be disabled while the timing is taking place to prevent the computer "being somewhere else" when the signal makes a transition and thus not being able to start/stop the timer accurately.

This has the unfortunate side effect that the computer will hang up waiting for a transition if no signal is being applied to the input. If this happens, only the Break key will bring it back to life. Using this method you can measure frequencies from 200 KHz down to about 160Hz (period of 64mS). This lower limit is given by the maximum time that Timer 1 can be set to run.

If you want to measure even longer single cycles you can arrange for the signal to go into control line 1 on the user port and to generate an interrupt every time a transition is made.

Again the internal event timer can be read and the frequency calculated. This will only be accurate on low frequencies due to the 10 mS resolution of the event timer. I will leave this one as an exercise for you to try. It will have the advantage of not hanging up when no signal is present.

If you want to increase the sensitivity of the signal input you can add some additional gain before the gating transistor. One way of doing this is to use an operational amplifier in the way we have done in the past.

Figure III shows how this may be done using an LM324. It basically consists of two stages of amplification followed by a Schmitt trigger. As the operation of these elements have been described in a previous article there is no point in repeating it.

Also note there is no kit this month as the single transistor gating circuit is so simple it is just not worth laying out a printed circuit board.

Using the amplifier you can drive the input from an electric guitar and use it to tune it up as originally requested, but I have also been doing some experiments recording the frequencies produced.

Listing IV shows an automatic music plotting program. It is based around the gated counter method of frequency measurement and takes successive measurements and plots them out on a music stave. Then it plays back what you have just played to it.

To do this a list of notes with their corresponding frequencies are read into an array. Lines 80 to 170 do this. As we are to cover three octaves the frequencies are halved and first time through and doubled the last time, thus only one set of data is needed.

As the array contains the actual frequency of a note it is adjusted in lines 180 to 220 to contain a threshold frequency for the note so that we do not need to be spot on with our input.

The effect is that the program will choose the nearest note in the key of C to the one you play.

The next section of the program, lines 230 to 290, defines the shapes to make up the note. The first character (code 240) is actually the black hole in the middle of some notes.

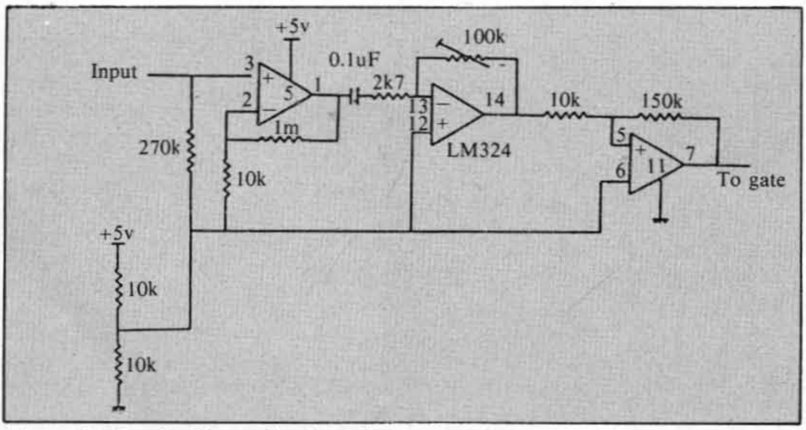

Figure III: Low level input signal amplifier

Next the machine code routine is assembled and you are asked for the length of sequence you wish to record. The limit on this is set at line 40 and can be extended if you require.

The program then draws the music staves on the screen and plots the notes as you play them. It will only plot a note as it is finished, because it records the number of times it measures the input frequency and finds it the same to determine what note to plot on the stave.

As each note is plotted it is RECorded in an array REC% for use when playing back the tune.

Finally, when the length of note sequence is reached, or the space bar is pressed, the tune is played back. If you want it can be repeated or you can try again.

I use the word tune very loosely, as the timing will inevitably be different from the original. I have tried it out with an input from my signal generator but not from any musical instruments and I make no promises about how good it is, only to say that it is "interesting"!

As an experiment I attached a microphone to the input and sang into it. The results were very interesting, but bore no relationship to what I sang.

There is obviously scope for further refinement here.

The major cause of difficulty was getting a good clean frequency signal from a source so rich in harmonics as the human voice. I found the vibrato kept coming through stronger than the fundamental frequency and this had the effect of putting in spurious notes.

Whistling was better, but I had to move the program up an octave as I tend to whistle at frequencies in excess of 1200Hz.

Nevertheless, it is great fun to try. It is very easy to turn the fact that it does not work very well into a feature – "It can be an aid to original composition".

Sing a well known tune into the computer and get something totally different out of it!

The single cycle timing method of

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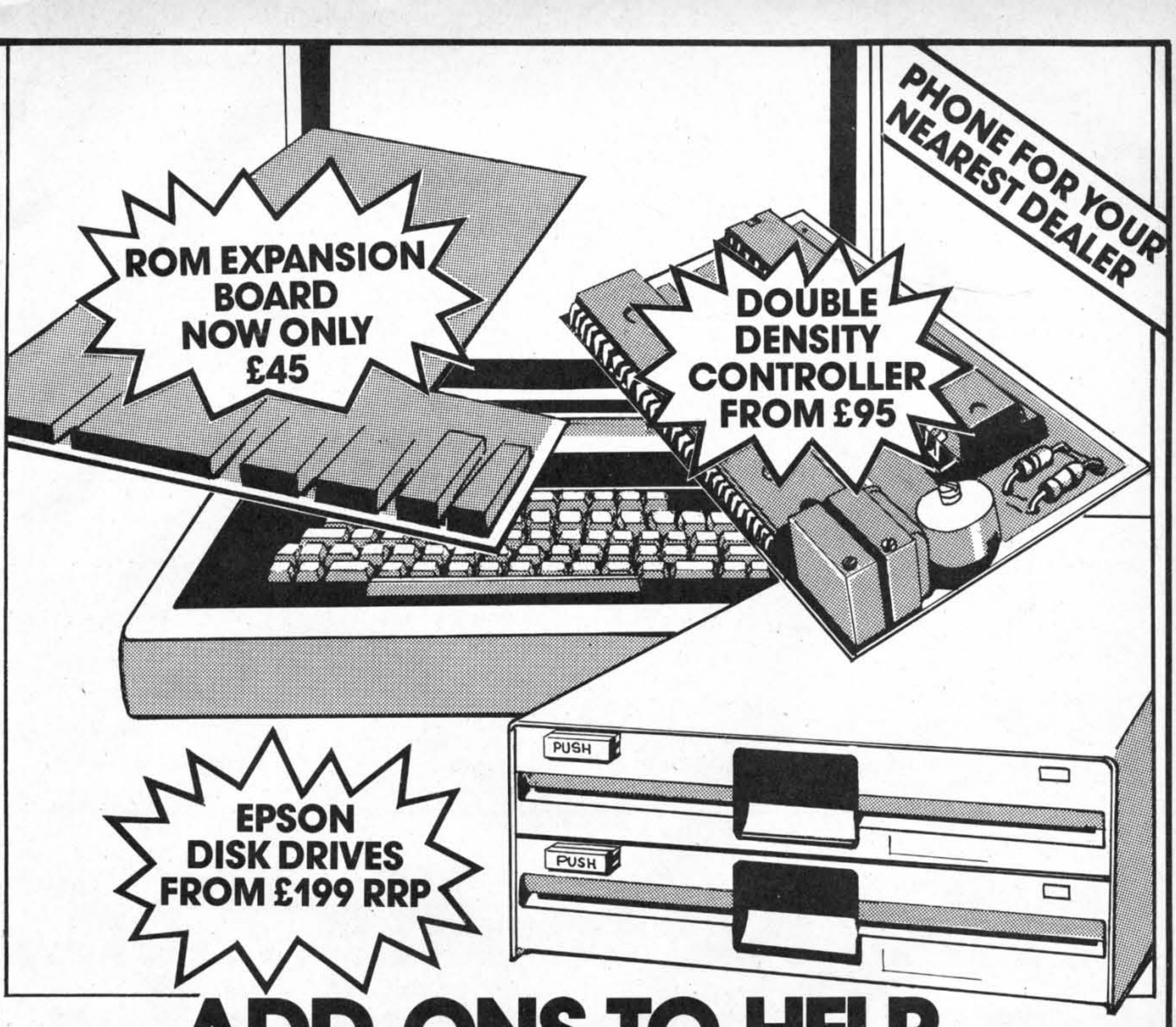
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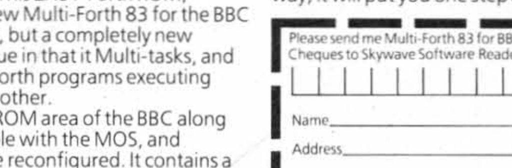

16k Eprom type 27128

Multi-tasking operating system for Real-Time use.

Here's the Forth Eprom for the BBC Micro that makes all others out of date.

It's Multi-Forth 83 from David Husband who has built his reputation for Quality Forth products with his ZX81-Forth ROM, Spectrum Forth-I/O Cartridge and now New Multi-Forth 83 for the BBC Micro. This is not rehashed Forth 79 Code, but a completely new version of the Forth 83 Standard. It's unique in that it Multi-tasks, and therefore the user can have a number of Forth programs executing simultaneously and transparently of each other.

Multi-Forth 83 sits in the sideways ROM area of the BBC along with any other ROMs in use. It is compatible with the MOS, and specially vectored to enable a system to be reconfigured. It contains a Standard 6502 Assembler, a Standard Screen Editor, and a Unique Stack Display Utility.

With this Forth, David Husband has provided the BBC Micro with capabilities never before realised. And being 16K rather than 8K is twice the size of other versions. Multi-Forth 83 is supplied with an extensive Manual (170 pages plus) and at £40 + VAT it is superb value.

Order it using the coupon adding £2.30 p&p (£5 for Europe, £10 outside) or if you want more information, tick that box instead. Either way, it will put you one step ahead of the competition.

Please send me Multi-Forth 83 for BBC Micro. £40 + VAT. De-luxe System inc. Disc £80 + VAT.
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Skywave SOFTWARE

MULTI-FORTH 83 FOR THE BBC MICRO

THE BEEB BODY BUILDING COURSE

From Page 140

frequency measurement could be incorporated into this program to snatch a single note. This might produce better results when using an instrument to input the tune.

The program could also be altered to allow editing of the tune once it has been entered, and you could get it to plot out the tune as it is played.

You could even modify it so that you dispense with the frequency measuring part and enter a tune note by note from the keyboard.

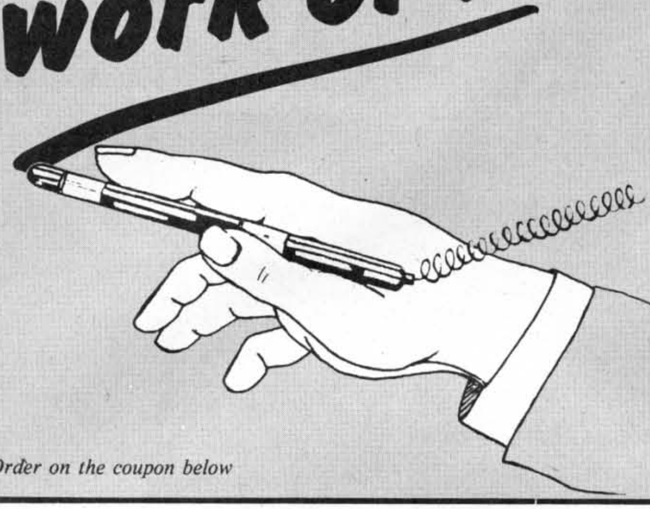
For those interested in tuning, how about writing a program where the difference between your note and what you are aiming at is represented as a variable length line or other graphical means?

Like most Body Build articles I have given you the tools for the job – it is now up to you. See you next month.

```
   10 REM AUTOMATIC MUSIC PLOTTER
   20 REM By Mike Cook
   30 R%=24
   40 SM%=202
   50 LAST%=1000
   60 L%=0
   70 DIM PITCH$(R%),T%(R%),REC%(1,SM
%),CODE% 30
   80 FOR OCTIVE%=0 TO 2
   90 RESTORE 1170
  100 D%=OCTIVE%*8
  110 FOR B%=1 TO R%/3
  120 READ PITCH$(B%+D%)
  130 READ T%(B%+D%)
  140 IF OCTIVE%=0 THEN T%(B%+D%)=T%(
B%+D%)/2
  150 IF OCTIVE%=2 THEN T%(B%+D%)=T%(
B%+D%)*2
  160 NEXT
  170 NEXT
  180 REM ADJUST FREQUENCY THRESHOLD
  190 FOR A%=1 TO R%-1
  200 T%(A%)=T%(A%)+((T%(A%+1)-T%(A%)
)/2)
  210 NEXT
  220 T%(0)=T%(1)-50
  230 VDU 23,240,0,0,0,0,0,0,254,0
  240 VDU 23,241,3,2,2,2,2,58,124,56
  250 VDU 23,242,2,2,2,2,2,58,124,56
  260 VDU 23,243,2,2,2,2,2,58,124,57
  270 VDU 23,244,2,2,2,2,2,58,68,56
  280 VDU 23,245,0,0,0,0,0,56,68,56
  290 VDU 23,246,2,2,2,2,2,58,68,57
  300 FOR A%=0 TO 3 STEP 3
  310 P%=CODE%
  320 [
  330 OPT A%
  340 .FREQ
  350 LDA #&A0
  360 STA &FE6B
  370 LDA #&FF
  380 STA &FE68
  390 STA &FE69
  400 STA &FE64
  410 STA &FE65
  420 RTS
  430 ]
  440 NEXT
  450 MODE1
  460 PRINT"BEEB BODY BUILDING COURSE
"
  470 PRINT"AUTOMATIC MUSIC PLOTTER"
  480 PRINT"By Mike Cook"
  490 PRINT
  500 PRINT"Using the user port to in
put sound"
  510 PRINT
  520 PRINT"You can terminate the seq
uence with"
  530 PRINT"the space bar"
  540 REPEAT
  550 PRINT
  560 N%=1
  570 INPUT"INPUT SEQUENCE LENGTH",SL
%
  580 SL%=SL%+1
  590 IF SL%>SM% THEN PRINT"MAXIMUM "
;SM%-1:GOTO 570
  600 CALL FREQ
  610 GCOL 0,3
  620 CLS
  630 X%=0
  640 PROC_LINES(256)
  650 REPEAT
  660 F=INT((&FFFF-(?&FE68+?&FE69*256
))/.064)
  670 CALL FREQ
  680 TIME=0
  690 PRINT TAB(0,13);"FREQUENCY IS "
;F;" Hz";SPC(8)
  700 REM SERCH FOR NOTE
  710 B%=-1
  720 REPEAT
  730 B%=B%+1
  740 UNTIL T%(B%)>F OR B%=R%
  750 PRINT "NOTE IS ";PITCH$(B%)
  760 IF LAST%=B% THEN L%=L%+1 ELSE P
ROC_NOTE(LAST%,L%):LAST%=B%
  770 IF L%=8 THEN PROC_NOTE(LAST%,8)
:L%=1
  780 IF INKEY(-99) THEN SL%=N%
  790 REPEAT:UNTIL TIME>6
  800 UNTIL N%=SL%
  810 *FX21,0
  820 REPEAT
  830 PROC_PLAY
  840 PRINT TAB(0,27);"Press RETURN f
or a new sequnce"
  850 PRINT"Any other key to repeat t
une!"
  860 A%=GET
  870 UNTIL A%=13
  880 UNTIL FALSE
  890 DEF PROC_NOTE(B%,L%)
  900 IF B%=0 THEN ENDPROC
  910 REC%(0,N%)=B%
  920 REC%(1,N%)=L%
  930 N%=N%+1
  940 PLACE%=192+B%*8
  950 IF L%=5 THEN L%=6
  960 IF L%=7 OR L%=8 THEN L%=5
  970 VDU 5
  980 MOVE X%,PLACE%
  990 VDU 18,0,0,240,8,18,0,1,240+L%,
4
 1000 X%=X%+40
 1010 IF X%>1280 THEN CLS:GCOL0,3:PRO
C_LINES(256):X%=0
 1020 ENDPROC
 1030 DATA "C",261.6256,"D",293.6648,
"E",329.6276
 1040 DEF PROC_LINES(Y%)
 1050 FOR A%=1 TO 5
 1060 MOVE 0,Y%
 1070 DRAW 1280,Y%
 1080 Y%=Y%+16
 1090 NEXT
 1100 ENDPROC
 1110 DEF PROC_PLAY
 1120 FOR A%=1 TO SL%-1
 1130  SOUND 1,-9,REC%(0,A%)*8+5,REC%
(1,A%)
 1140 SOUND 1,0,88,1
 1150 NEXT
 1160 ENDPROC
 1170 DATA "C",261.6256,"D",293.6648
 1180 DATA "E",329.6276,"F",349.2282
 1190 DATA "G",391.9954,"A",440.000
 1200 DATA "B",493.8833,"C",523.2511
```

Listing IV

Make light work of it



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We'll be publishing lots of interesting applications for the lightpen in forthcoming editions of *Micro User*. But if you simply can't wait, incorporating a lightpen in your own programs is simplicity itself.

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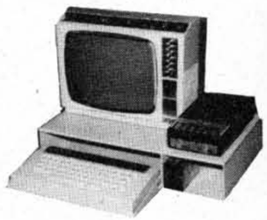

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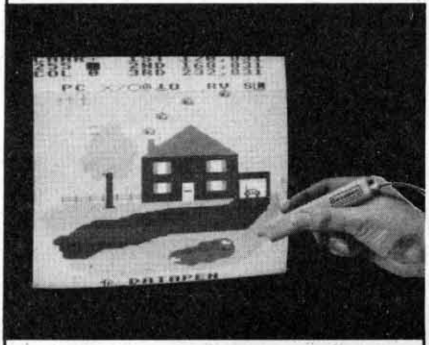
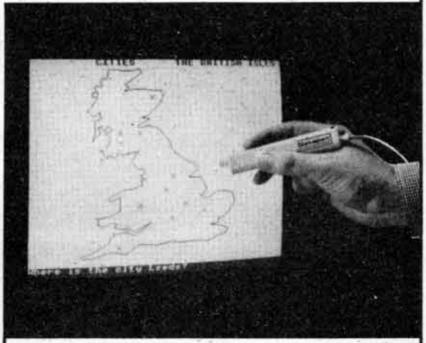


Teletext
Display
CREATOR



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Please send your cheque/P.O. to:-

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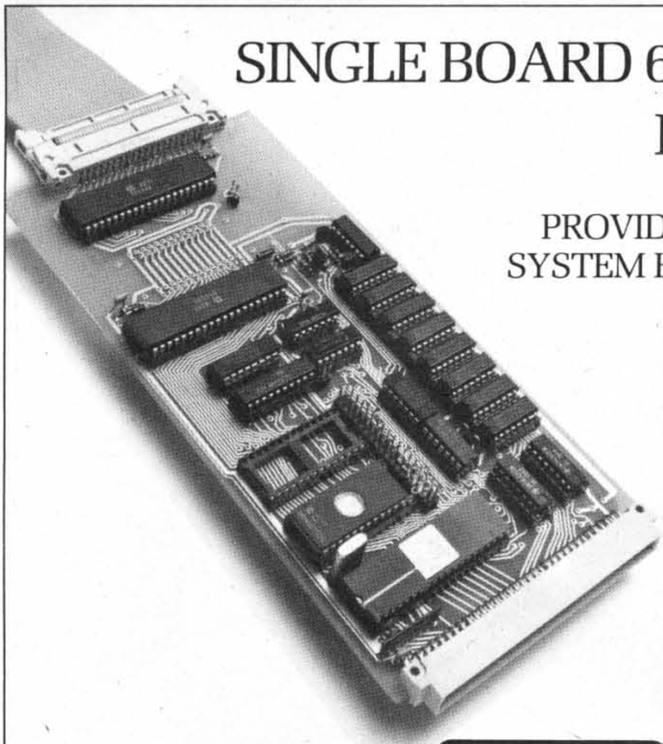

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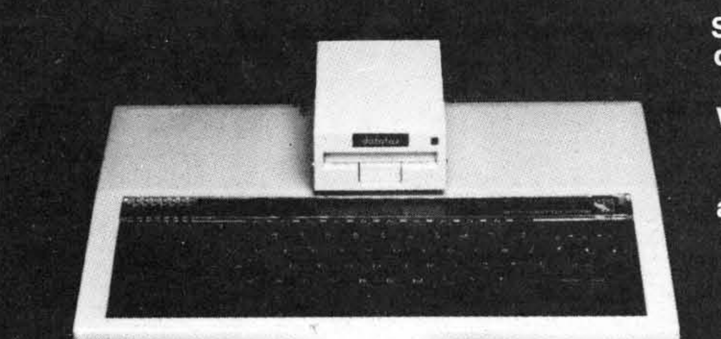

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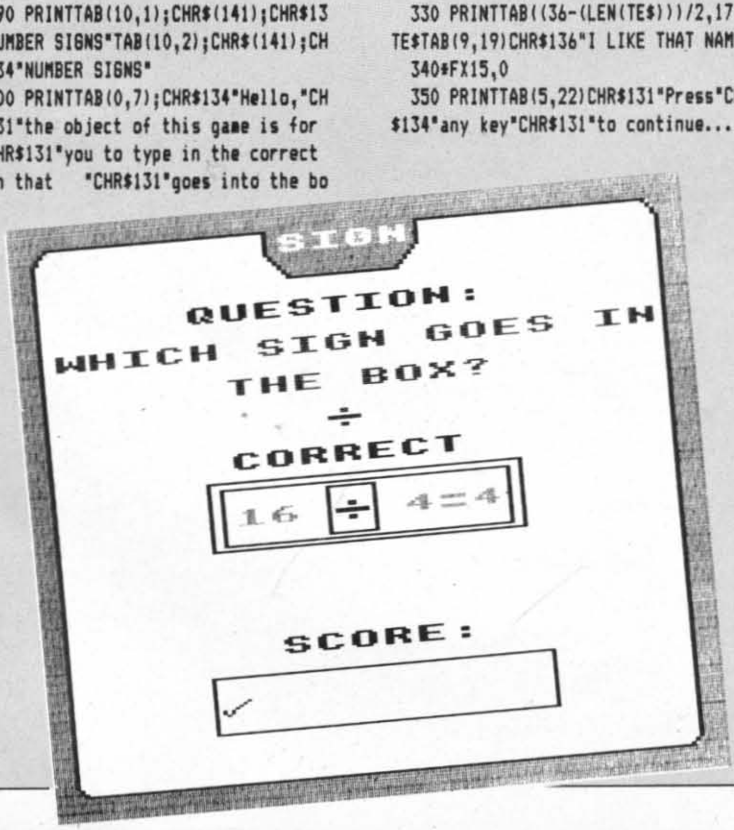
Number Signs listing

Classroom Corner

From Page 71

```
  10 MODE 7
  15 VDU23;8202;0;0;0;
  20 PROCinit
  30 PROCinstr
  40 PROCtune
  50 PROCname
  55 REPEAT
  56 PROCinit
  60 MODE 2
  65 VDU23;8202;0;0;0;
  70 PROCcalc
  80 PROCscreen
  90 PROCgame
 100 MODE 7
 105 VDU23;8202;0;0;0;
 110 PROCscore
 120 UNTIL 0
 130 DEFPROCinit
 140 VDU 23,224,0,1,2,4,8,80,80,32,2
3,225,0,64,34,20,24,16,40,68
 150 VDU 23,230,24,24,24,255,255,24,
24,24,23,231,0,0,0,255,255,0,0,0,23,2
32,195,231,126,60,60,126,231,195,23,2
33,24,24,0,255,255,0,24,24,23,234,0,1
26,126,0,0,126,126,0
 160 SC=0:X%=6:Y%=16:X=0:SX=5:SY=26:
R$="":delay=6250:BX=564:BY=457:level=
8
 170 ENDPROC
 180 DEFPROCinstr
 190 PRINTTAB(10,1);CHR$(141);CHR$13
1"NUMBER SIGNS"TAB(10,2);CHR$(141);CH
R$134"NUMBER SIGNS"
 200 PRINTTAB(0,7);CHR$134"Hello,"CH
R$131"the object of this game is for
 "CHR$131"you to type in the correct
sign that   "CHR$131"goes into the bo
x that will appear on  "CHR$131"the s
creen when you are asked."
 210 PRINT''CHR$131"On the keyboard
of the computer:       "''CHR$134"
      *"CHR$131"means 'multiplies'"
 215 PRINTCHR$134"           /"CHR$13
1"means 'divide'"'CHR$134"           -
"CHR$131"means 'take away'"'CHR$134"
        +"CHR$131"means 'add'"
 220 PRINTTAB(10,20);CHR$(141);CHR$1
34"GOOD-LUCK"TAB(10,21);CHR$(141);CHR
$131"GOOD-LUCK"
 230 *FX 15,0
 240 PRINTTAB(5,22);CHR$131"Press"CH
R$134"any key"CHR$131"to continue....
":A$=GET$
 250 ENDPROC
 260 DEFPROCname
 280 CLS:PRINTTAB(10,1);CHR$(141);CH
R$131"NUMBER SIGNS"TAB(10,2);CHR$(141
);CHR$134"NUMBER SIGNS"
 290 SOUND -1,241,0,0:SOUND -1,192,0
,0:SOUND -1,290,0,0:SOUND -1,223,0,0
 300 PRINTTAB(6,9)CHR$131"Please ent
er your name"TAB(8,10)CHR$131"then pr
ess Return"
 305 PRINT TAB(11,12)CHR$(145)"<,,,,
,,,,,,,l"TAB(11,13);CHR$(145);"5
   j"TAB(11,14);CHR$(145);"-,,,,,,,,,
,,."
 310 PROCdelay
 320 A$=FNinput("Z","A",7)
 330 PRINTTAB((36-(LEN(TE$)))/2,17);
TE$TAB(9,19)CHR$136"I LIKE THAT NAME"
 340*FX15,0
 350 PRINTTAB(5,22)CHR$131"Press"CHR
$134"any key"CHR$131"to continue...."
:A$=GET$
 360 ENDPROC
 370 DEFPROCtune
 380 FOR data=1 TO 7
 390 READ pitch,duration
 400 FOR notes=1 TO 3
 410 SOUND notes,-15,pitch,duration
 420 NEXT
 430 NEXT
 440 DATA 117,5,117,5,121,5,117,5,10
9,5,101,10,149,5
 450 PROCdelay
 460 ENDPROC
 470 DEFPROCscreen
 480 GCOL 0,5
 490 MOVE 0,0:MOVE 0,100:PLOT 85,100
,0:MOVE 1180,0:MOVE 1280,0:PLOT 85,12
80,100:MOVE 0,900:MOVE 0,1024:PLOT 85
,100,1024:MOVE 1280,900:MOVE 1280,102
4:PLOT 85,1180,1024:MOVE 0,0:MOVE 0,1
024:PLOT 85,40,0:PLOT 85,40,1024
 500 MOVE 1280,0:MOVE 1280,1024:PLOT
 85,1230,0:PLOT 85,1230,1024:MOVE 0,1
024:MOVE 1280,1024:PLOT 85,0,980:PLOT
 85,1280,980:MOVE 0,0:MOVE 1280,0:PLO
T 85,0,40:PLOT 85,1280,40
 510 MOVE 480,980:MOVE 770,980:PLOT
85,480,900:PLOT 85,770,900:GCOL 0,0:M
OVE 520,900:MOVE 480,900:PLOT 85,480,
940:MOVE 730,900:MOVE 770,900:PLOT 85
,770,940:GCOL 0,7
 520 MOVE 60,40:DRAW 40,60:DRAW 40,9
50:DRAW 70,980:DRAW 480,980:DRAW 480,
940:DRAW 520,900:DRAW 730,900:DRAW 77
0,940:DRAW 770,980
 530 DRAW 1200,980:DRAW 1230,950:DRA
W1230,60:DRAW 1210,40:DRAW 60,40
 540 VDU 5:MOVE 510,975:GCOL 0,4:PRI
NT"SIGN":VDU 4
 550 GCOL 0,7:MOVE 315,128:DRAW 315,
224:DRAW 960,224:DRAW 960,128:DRAW 31
5,128
 560 MOVE 362,450:DRAW 362,547:DRAW
904,547:DRAW 904,450:DRAW 362,450:MOV
```



SIGN

QUESTION:
WHICH SIGN GOES IN
THE BOX?
÷

CORRECT

16 ÷ 4=4

SCORE:
✓

→

Number Signs listing

Classroom
Corner

From Page 147

```
E 342,440:DRAW 342,557:DRAW 928,557:D
RAW 928,440:DRAW 342,440
  570 ENDPROC
  580 DEFPROCbox(C%)
  590 GCOL 0,C%
  600 MOVE BX,BY:DRAW BX,BY+80:DRAW B
X+84,BY+80:DRAW BX+84,BY:DRAW BX,BY
  610 ENDPROC
  620 DEFPROCcalc
  630 A=RND(level):B=RND(level):CH=RN
D(4)
  640 ON CH GOTO 650,670,720,740
  650 IF A=2 AND B=2 THEN GOTO 630 EL
SE C=A+B:A$=CHR$(230):CH$="+"
  660 GOTO 760
  670 IF A>B THEN C=A-B
  680 IF B>A AND B<>A THEN GOTO 630
  690 IF B=A THEN GOTO 630
  700 A$=CHR$(231):CH$="-"
  710 GOTO 760
  720 IF A=1 OR B=1 OR A=2 AND B=2 TH
EN GOTO 630 ELSE C=A*B:A$=CHR$(232):C
H$="*"
  730 GOTO 760
  740 IF B=1 THEN GOTO 630 ELSE IF A/
B=INT(A/B) THEN:C=A*B:A=C:C=A/B ELSE
GOTO 630
  750 A$=CHR$(233):CH$="/"
  760 IF A>=10 THEN X=1 ELSE X=0
  770 X%=6:IF B>=10 OR C>=10 THEN:X%=
X%-1:BX=500 ELSE BX=564
  780 IF A/B=C AND A-B=C THEN GOTO 63
0
  790 ENDPROC
  800 DEFPROCgame
  810 COLOUR 3:PRINTTAB(7,23);"SCORE:
"
  820 FOR T=1 TO 10
  830 TL$="Test for "+TE$
  840 PROCbox(0):PROCcalc:PROCbox(7)
  850 PRINTTAB(6,16);" ":COLOUR 1:IF
X=1 THEN:PRINTTAB(X%,Y%);A ELSE PRINT
TAB(X%+1,Y%);A
  860 PRINTTAB(X%+5,Y%);B;CHR$(234);C
  870 COLOUR 3:PRINTTAB(5,5);"QUESTIO
N:";:COLOUR 4:PRINT;T:PRINTTAB(2,29);
TL$:COLOUR 6:PRINTTAB(1,7);"WHICH SIG
N GOES IN"TAB(6,9);"THE BOX?"
  880 *FX 15,0
  890 D$=GET$:IF D$=":" OR D$=";" THE
N:COLOUR 12:SOUND 2,-15,88,8:SOUND 2,
-15,77,7:PRINTTAB(4,20);"PRESS SHIFT"
TAB(4,21);"AND THE KEY":FOR D=1 TO de
lay:NEXT:PRINTTAB(4,20);SPC(11)TAB(4,
21);SPC(12):COLOUR 7:GOTO 880
  900 F=INSTR("*/-+",D$)
  910 IF F=0 THEN GOTO 890
  920 IF F=4 THEN P$=CHR$(230)
  930 IF F=3 THEN P$=CHR$(231)
  940 IF F=1 THEN P$=CHR$(232)
  950 IF F=2 THEN P$=CHR$(233)
  960 FOR DL=1 TO 2000:NEXT:PRINT TAB
(9,11);P$
  970 IF D$=CH$ THEN:M$="CORRECT":p=-
10:char=224:s=1 ELSE M$=" WRONG":p=-2
:char=225:s=0
  980 PROCmessage(M$,p,char,s)
  990 NEXT
 1000 ENDPROC
 1010 DEFPROCmessage(N$,P,CHAR,S)
 1020 *FX 15,0
 1030 COLOUR 3:PRINTTAB(SX,SY);CHR$(C
HAR)
 1040 SX=SX+1:SC=SC+S
 1050 FOR sound=-15 TO 1 STEP 5
 1060 SOUND 2,sound,sound*P,2:SOUND 3
,sound,sound*P,2:SOUND 1,sound,sound*
P,2
 1070 NEXT
 1080 IF X=1 THEN X%=9 ELSE X%=X%+3
 1090 COLOUR 7:PRINTTAB(X%,Y%);P$:*FX
 15,0
 1100 COLOUR S+14:Z%=(19-(LEN(N$)))/2
:PRINTTAB(Z%,13);N$
 1110 IF S=0 THEN PRINTTAB(2,20);"THE
 ANSWER IS ";A$
 1120 PROCdelay:PRINTTAB(Z%,13);SPC(L
EN(N$))TAB(2,20);SPC(16)
 1130 PROCbox(0):PRINTTAB(7,16);SPC(7
)TAB(9,11);" "
 1140 ENDPROC
 1150 DEFPROCscore
 1160 PRINTTAB(10,1)CHR$(141)CHR$131"
NUMBER SIGNS"TAB(10,2)CHR$(141)CHR$13
4"NUMBER SIGNS"
 1170 IF SC<=2 THEN re$="NOT VERY GOO
D"
 1180 IF SC>2 AND SC<=5 THEN re$="FAI
R"
 1190 IF SC>5 AND SC<=7 THEN re$="GOO
D"
 1200 IF SC>7 AND SC<10 THEN re$="VER
Y GOOD"
 1210 IF SC=10 THEN re$="EXCELLENT"
 1220 PRINTTAB(4,8)CHR$131"Your score
 was"CHR$134;SC;CHR$131"out of"CHR$13
4"10"
 1230 PRINTTAB(9,10)CHR$134"This was"
 1240 PRINTTAB((35-(LEN(re$)))/2,12);
re$
 1250 IF SC<=5 THEN PRINTTAB(6,14)CHR
$131"TRY HARDER NEXT TIME"
 1260 PRINTTAB(6,16)CHR$134"DO YOU WA
NT ANOTHER GO?"
 1270 PRINTTAB(17,19);:G$=GET$:IF G$=
"Y" THEN:PRINTG$:ENDPROC ELSE:PRINTTA
B(12,19);CHR$(141);"BYE-BYE"TAB(12,20
);CHR$(141);"BYE BYE":END
 1280 ENDPROC
 1290 DEFFNinput(HI$,LO$,NU)
 1300 LOCAL HI,LO,CO,EN,DE
 1310 LOCAL RE,EN$
 1320 *FX15,0
 1321 PRINTTAB(15,13);SPC(7)TAB(15,15
);SPC(7)TAB(2,19);SPC(40);TAB(10,21);
SPC(40):DE=127:RE=13:HI=ASC(HI$):LO=A
SC(LO$):CO=0:TE$="":REPEAT:REPEAT
 1330 OK=FALSE:PRINTTAB(CO+15,13);:EN
$=GET$:*FX 15,0
 1340 EN=ASC(EN$)
 1350 IF EN=32 THEN PRINT" ";:CO=CO+1
 1360 IF EN>=LO AND EN<=HI THEN OK=TR
UE
 1370 UNTIL OK OR EN=DE OR EN=RE
 1380 CO=CO+1:IF EN=DE AND CO>=1 THEN
:CO=CO-2
 1390 IF EN=RE THEN CO=CO-1
 1400 TE$=TE$+EN$
 1410 IF EN<>RE THEN PRINTEN$;
 1420 IF CO=NU THEN:PRINTTAB(2,19)CHR
$131"I CANNOT REMEMBER A NAME SO LONG
"TAB(10,21)CHR$131"PLEASE TRY AGAIN":
FOR DEL=1 TO 3000:NEXT:GOTO 1320
 1430 UNTIL EN=RE
 1440 IF EN=RE AND LEN(TE$)<=1 THEN :
PRINTTAB(2,19)CHR$131"YOU HAVE NOT TY
PED IN YOUR NAME"TAB(10,21)CHR$131"PL
EASE TRY AGAIN":FOR DEL=1 TO 3000:NEX
T:GOTO 1320
 1450 PRINT
 1460 =TE$
 1470 DEFPROCdelay:FOR DEL=1 TO delay
:NEXT:ENDPROC
```

This listing is included in this month's cassette tape offer. See order form on Page 193.

wildings
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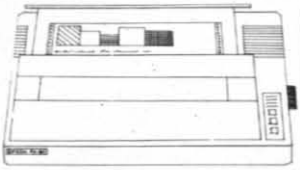

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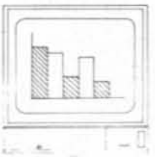

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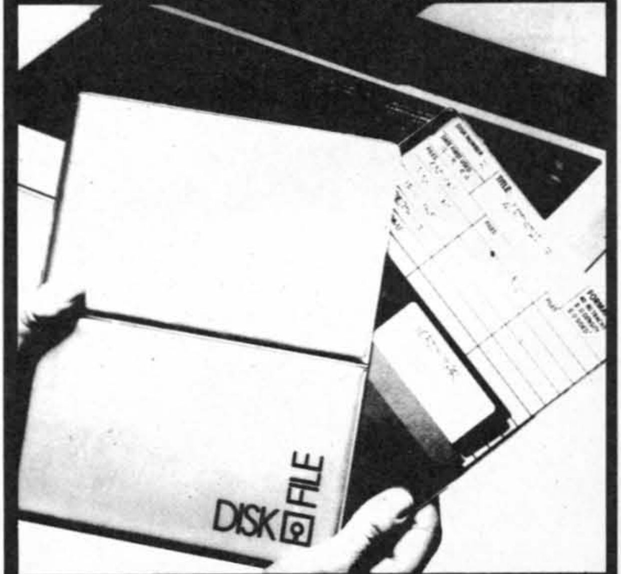

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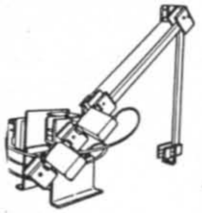
ROBOTICS

ROBOT ARM



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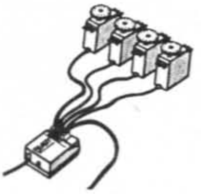

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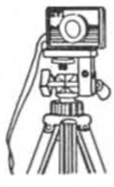
VISION



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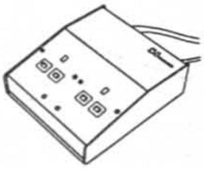

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Rollerball listing

From Page 133

The listings in this article are produced using a special formatter which breaks one program line over several lines of listing. When entering a line don't press Return until you come to the next line number. Full details of the formatter are in the July 1983 issue of *The Micro User*.

```
  10 REM **********************
  20 REM * ROLLERBALL *
  30 REM * by *
  40 REM * Geoff Turner *
  50 REM * 1984 *
  60 REM **********************
  70 *TV255
  80 ON ERROR MODE 7
     :REPORT
     :PRINT " ";ERL
     :END
  90 P%=&D00
 100 [
 110 OPT2
 120 SEI
 130 LDA#128
 140 LDX#250
 150 JSR&FFF4
 160 STX&70
 170 CLI
 180 RTS
 190 ]
 200 MODE 7
 210 PROCINIT1
 220 PROCINIT2
 230 PROCINSTRUCTIONS
 240 MODE 2
 250 VDU 5
 260 PROCSCREEN
 270 TIME =0
 280 PROCMAINLOOP
 290 PROCEND
 300 CLG
 310 MODE 7
 320 PRINT TAB(5,5);CHR$ (131);"YOU
       TOOK  ";T%;" SECONDS"
 330 PRINT
 340 IF T%>200
     :C$="THAT WAS TERRIBLE !!!"
 350 IF T%<150
     :C$="THAT WAS A POOR ATTEMPT"
 360 IF T%<120
     :C$="THAT WAS QUITE GOOD"
 370 IF T%<80
     :C$="THAT WAS VERY GOOD"
 380 IF T%<40
     :C$="THAT WAS EXCELLENT"
 390 IF T%<20
     :C$="YOU CHEATED !!! "
 400 PRINT TAB(5,7);CHR$ (133);C$
 410 PRINT
 420 PRINT TAB(6,10);"PLAY AGAIN
       (Y/N) ?"
 430 PROCMUSIC
 440 *FX21,0
 450 I$=INKEY$ (5)
```

```
 460 IF I$="Y" CLS
     :GOTO 220
 470 IF I$<>"N"
     THEN 430
 480 CLS
     :*FX11,32
 490 END
 500 DEF PROCSCREEN
 510 VDU 23,1,0;0;0;0;
 520 GCOL 0,2
 530 IF C%=3
     THEN VDU 19,2,0,0,0,0
 540 X%=0
     :Y%=0
     :A%=1008
     :B%=1000
 550 REPEAT
 560 IF X%>400
     THEN GCOL 0,3
 570 MOVE X%,Y%
 580 DRAW X%,B%
 590 DRAW A%,B%
 600 DRAW A%,Y%
 610 DRAW X%,Y%
 620 X%=X%+64
     :Y%=Y%+64
 630 A%=A%-64
     :B%=B%-64
 640 UNTIL X%>500
 650 RESTORE 1710
 660 GCOL 0,2
 670 FOR I%=1 TO 7
 680 READ A%,B%
 690 MOVE A%,B%
 700 DRAW A%,B%+56
 710 NEXT
 720 FOR I%=1 TO 7
 730 READ A%,B%
 740 MOVE A%,B%
 750 DRAW A%,B%-56
 760 NEXT
 770 FOR I=1 TO 6
 780 READ A%,B%
 790 MOVE A%,B%
 800 DRAW A%+56,B%
 810 NEXT
 820 FOR I=1 TO 5
 830 READ A%,B%
 840 MOVE A%,B%
 850 DRAW A%-56,B%
```

```
 860 NEXT
 870 GCOL 0,0
 880 FOR I=1 TO 7
 890 READ A%,B%
 900 MOVE A%,B%
 910 DRAW A%+64,B%
 920 NEXT
 930 FOR I=1 TO 8
 940 READ A%,B%
 950 MOVE A%,B%
 960 DRAW A%+64,B%
 970 NEXT
 980 FOR I=1 TO 9
 990 READ A%,B%
1000 MOVE A%,B%
1010 DRAW A%,B%+64
1020 NEXT
1030 FOR I=1 TO 7
1040 READ A%,B%
1050 MOVE A%,B%
1060 DRAW A%,B%+64
1070 NEXT
1080 MOVE 480,552
1090 DRAW 480+48,552
1100 FOR I%=8 TO 11
1110 VDU 19,I%,7,0,0,0
1120 NEXT
1130 VDU 19,V%+7,15,0,0,0
1140 VDU 19,H%+7,15,0,0,0
1150 GCOL 0,11
1160 MOVE 1152,200
1170 DRAW 1152,304
1180 DRAW 1120,272
1190 MOVE 1152,304
1200 DRAW 1184,272
1210 GCOL 0,10
1220 MOVE 1152,200
1230 DRAW 1152,96
1240 DRAW 1120,128
1250 MOVE 1152,96
1260 DRAW 1184,128
1270 GCOL 0,9
1280 MOVE 1152,200
1290 DRAW 1048,200
1300 DRAW 1080,168
1310 MOVE 1048,200
1320 DRAW 1080,232
1330 GCOL 0,8
1340 MOVE 1152,200
1350 DRAW 1254,200
1360 DRAW 1222,232
1370 MOVE 1254,200
1380 DRAW 1222,168
1390 COLOUR 5
1400 VDU 4
1410 PRINT TAB(16,2);"Time";
```

→

SPELLWISE

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Or is it just a littel bit off kei?
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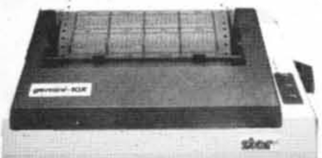

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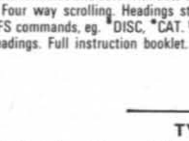

```
      Command (? for help)

          Jan     Feb     Mar
 1 Car tax  75.00   0.00    0.00
 2 Insure    0.00 150.00    0.00
 3 Loan    150.00 150.00  150.00
 4 Deprec  100.00 100.00  100.00
 5 Repairs   0.00  25.00    0.00
 6 Maint.    0.00   0.00   56.00
 7 Petrol   36.00  25.00   52.00
 8 Oil       0.00   5.00    0.00
 9 Other    12.00   3.00    3.00
10
11 Total   373.00 458.00  361.00
12
13 Mileage 600.00 400.00  850.00
14 MPG      30.33  29.12   29.75
15 Cost/ml   0.82   1.14    0.42
```

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CONTEX COMPUTING (B9)
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Rollerball listing

From Page 152

```
1420 PRINT TAB(16,6);"Secs";
1430 VDU 5
1440 ENDPROC
1450 DEF PROCINIT1
1460 VDU 5
1470 *FX11,0
1480 ENVELOPE 1,1,70,16,2,2,0,0
     ,126,0,0,-126,80,80
1490 ENVELOPE 2,1,0,0,0,0,0,0,126
     ,-4,0,0,50,25
1500 ENVELOPE 3,1;0,0,0,0,0,0,126
     ,-10,-5,-2,80,80
1510 DIM P%(5),Q%(5),X%(5),Y%(5)
     ,N%(54),D%(54)
1520 VDU 23,224,112,248,248,248
     ,112,0,0,0
1530 VDU 23,225,112,248,232,192
     ,96,0,0,0
1540 VDU 23,226,96,192,232,248,112
     ,0,0,0
1550 VDU 23,227,112,248,184,24,48
     ,0,0,0
1560 VDU 23,228,48,24,184,248,112
     ,0,0,0
1570 Q%=0
1580 RESTORE 3110
1590 FOR I%=1 TO 54
1600 READ N%(I%),D%(I%)
1610 NEXT
1620 ENDPROC
1630 DEF PROCINIT2
1640 H%=1
     :M%=16
     :V%=4
     :N%=8
     :D%=2
     :E%=0
     :C%=0
1650 X%(1)=16
     :Y%(1)=24
1660 X%(2)=16
     :Y%(2)=992
1670 X%(3)=960
     :Y%(3)=24
1680 X%(4)=960
     :Y%(4)=992
1690 ENDPROC
1700 REM MAZE DATA
1710 DATA 208,4,800,4,608,68,256
     ,132
1720 DATA 674,132,512,196,576,324
1730 DATA 512,996,192,932,848,932
1740 DATA 528,868,704,804,640,740
1750 DATA 384,676,8,504,72,320,72
     ,720
1760 DATA 136,400,200,640,264,504
1770 DATA 1000,304,1000,800,936
     ,400
1780 DATA 872,600,746,400
1790 DATA 320,64,640,64,400,128
     ,800,128
1800 DATA 320,192,560,256,432,320
1810 DATA 320,936,640,936,224,872
1820 DATA 720,872,416,808,592,808
1830 DATA 400,744,560,680,64,96
     ,64,360
1840 DATA 64,608,128,504,128,752
     ,192,256
1850 DATA 192,496,256,320,384,480
1860 DATA 944,128,944,640,880,512
1870 DATA 816,256,752,624,688,480
1880 DATA 624,400
1890 DEF PROCMAINLOOP
1900 REPEAT
1910 PROCMUSIC
1920 IF C%<>3
     THEN 1940
1930 IF INKEY (-102)
     THEN VDU 19,2,2,0,0,0,0
     ELSE VDU 19,2,0,0,0,0,0
1940 I$=INKEY$ (0)
     :IF I$=""
     THEN 2070
1950 G%=H%
     :U%=V%
1960 IF INKEY (-67) H%=1
     :M%=16
     :GOTO 2000
1970 IF INKEY (-98) H%=2
     :M%=-16
     :GOTO 2020
1980 IF INKEY (-105)V%=3
     :N%=-8
     :GOTO 2000
1990 IF INKEY (-73) V%=4
     :N%=8
     :GOTO 2010
2000 IF H%=1 AND V%=3
     THEN D%=1
     :GOTO 2040
2010 IF H%=1 AND V%=4
     THEN D%=2
     :GOTO 2040
2020 IF H%=2 AND V%=3
     THEN D%=3
     :GOTO 2040
2030 IF H%=2 AND V%=4
     THEN D%=4
2040 IF G%<>H% VDU 19,G%+7,7,0,0
     ,0
2050 IF U%<>V% VDU 19,U%+7,7,0,0
     ,0
2060 VDU 19,V%+7,15,0,0,0
     :VDU 19,H%+7,15,0,0,0
2070 FOR B%=1 TO L%
     :X%=X%(B%)
     :Y%=Y%(B%)
     :S%=M%
     :T%=N%
     :PROCCHECK
     :GCOL 0,0
     :MOVE X%(B%),Y%(B%)
     :VDU 224+D%
     :X%(B%)=X%(B%)+S%
     :Y%(B%)=Y%(B%)+T%
     :MOVE X%(B%),Y%(B%)
     :GCOL 0,1
     :VDU 224
     :NEXT
     :PROCTIME
     :PROCWIN
     :UNTIL E%=1
2080 ENDPROC
2090 DEF PROCCHECK
2100 ON D% GOTO 2110 ,2200 ,2290
     ,2380
2110 IF POINT(X%+48,Y%-12)<>0 S%=0
     :GOTO 2150
2120 IF POINT(X%+48,Y%-8)<>0 S%=0
     :GOTO 2150
2130 IF POINT(X%+48,Y%-16)<>0 S%=0
     :GOTO 2150
2140 IF POINT(X%+48,Y%-20)<>0 S%=0
2150 IF POINT(X%+24,Y%-24)<>0 T%=0
     :ENDPROC
2160 IF POINT(X%+16,Y%-24)<>0 T%=0
     :ENDPROC
2170 IF POINT(X%+32,Y%-24)<>0 T%=0
     :ENDPROC
2180 IF POINT(X%+40,Y%-24)<>0 T%=0
2190 ENDPROC
2200 IF POINT(X%+48,Y%+4)<>0 S%=0
     :GOTO 2240
2210 IF POINT(X%+48,Y%-8)<>0 S%=0
     :GOTO 2240
2220 IF POINT(X%+48,Y%)<>0 S%=0
     :GOTO 2240
2230 IF POINT(X%+48,Y%-4)<>0 S%=0
2240 IF POINT(X%+24,Y%+8)<>0 T%=0
     :ENDPROC
2250 IF POINT(X%+32,Y%+8)<>0 T%=0
     :ENDPROC
2260 IF POINT(X%+40,Y%+8)<>0 T%=0
     :ENDPROC
2270 IF POINT(X%+16,Y%+8)<>0 T%=0
2280 ENDPROC
2290 IF POINT(X%-16,Y%-12)<>0 S%=0
     :GOTO 2330
2300 IF POINT(X%-16,Y%-8)<>0 S%=0
     :GOTO 2330
```

→

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Rollerball listing

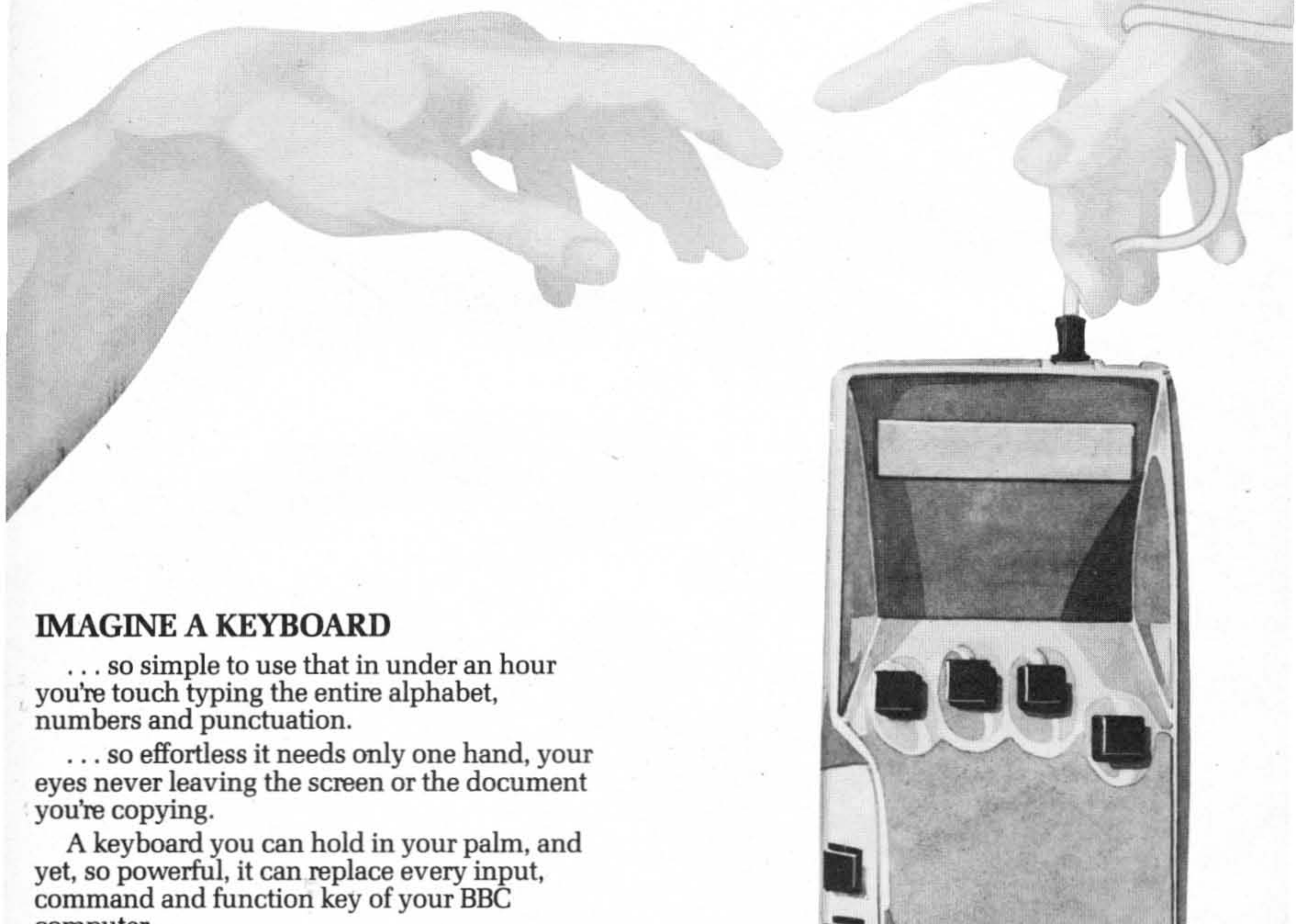
From Page 155

```
2310 IF POINT(X%-16,Y%-16)<>0 S%=0
     :GOTO 2330
2320 IF POINT(X%-16,Y%-20)<>0 S%=0
2330 IF POINT(X%+8,Y%-24)<>0 T%=0
     :ENDPROC
2340 IF POINT(X%+16,Y%-24)<>0 T%=0
     :ENDPROC
2350 IF POINT(X%,Y%-24)<>0 T%=0
     :ENDPROC
2360 IF POINT(X%-8,Y%-24)<>0 T%=0
2370 ENDPROC
2380 IF POINT(X%-16,Y%-44)<>0 S%=0
     :GOTO 2420
2390 IF POINT(X%-16,Y%-8)<>0 S%=0
     :GOTO 2420
2400 IF POINT(X%-16,Y%)<>0 S%=0
     :GOTO 2420
2410 IF POINT(X%-16,Y%+4)<>0 S%=0
2420 IF POINT(X%+8,Y%+8)<>0 T%=0
     :ENDPROC
2430 IF POINT(X%+16,Y%+8)<>0 T%=0
     :ENDPROC
2440 IF POINT(X%,Y%+8)<>0 T%=0
     :ENDPROC
2450 IF POINT(X%-8,Y%+8)<>0 T%=0
2460 ENDPROC
2470 DEF PROCTIME
     :VDU 4
     :VDU 23,1,0;0;0;0;
     :COLOUR 5
     :T%=INT (TIME /100)
     :PRINT TAB(16,4);T%;
     :VDU 5
     :ENDPROC
2480 DEF PROCWIN
     :I%=1
2490 IF X%(I%)>448 AND X%(I%)<520
      AND Y%(I%)<560 AND Y%(I%)>464

     THEN I%=I%+1
     ELSE ENDPROC
2500 IF I%<>L%+1 GOTO 2490
2510 E%=1
     :ENDPROC
2520 DEF PROCEND
2530 SOUND 3,1,100,10
2540 FOR A%=0 TO 600
     :PROCMUSIC
     :NEXT
2550 ENDPROC
2560 DEF PROCINSTRUCTIONS
2570 PRINT TAB(9,0);CHR$ (141);
     CHR$ (129);"ROLLER  BALL"
2580 PRINT TAB(9,1);CHR$ (141);
     CHR$ (129);"ROLLER  BALL"
2590 PRINT TAB(8,3);CHR$ (130);"By
       Geoff Turner"
2600 PRINT ''
2610 PRINT "This game simulates a
      plastic maze"
2620 PRINT "with a number of ball
      bearings."
2630 PRINT
2640 PRINT "The object of the game
      is to tilt"
2650 PRINT "the maze and steer all
      the balls to"
2660 PRINT "the centre of the maze."
2670 PRINT
2680 PRINT "The game ends when all
      the balls"
2690 PRINT "have reached the central
      square."
2700 PRINT '''
2710 PRINT SPC (8);CHR$ (133);"PRESS
      SPACE BAR."
2720 REPEAT
     : PROCMUSIC
     :UNTIL INKEY (-99)
2730 REPEAT
     : PROCMUSIC
     :UNTIL NOT INKEY (-99)
2740 CLS
2750 PRINT '''
2760 PRINT "Tilt the maze using the
      following keys."
2770 PRINT
2780 PRINT SPC (9);CHR$ (134);"Z
      tilts left"
2790 PRINT SPC (9);CHR$ (134);"X
      tilts right"
2800 PRINT SPC (9);CHR$ (134);"*
      tilts up"
2810 PRINT SPC (9);CHR$ (134);"?
      tilts down"
2820 PRINT
2830 PRINT "The direction of tilt
      is shown by"
2840 PRINT "the arrows at the bottom
      right of"
2850 PRINT "the screen."
2860 PRINT
2870 PRINT "The time taken is shown
      by the clock"
2880 PRINT "at the top of the screen.
     "
2890 PRINT '''
2900 PRINT SPC (8),CHR$ (133);"PRESS
      SPACE BAR"
2910 REPEAT
     :PROCMUSIC
     :UNTIL INKEY (-99)
2920 REPEAT
     :PROCMUSIC
     :UNTIL NOT INKEY (-99)
2930 CLS
2940 PRINT '''
2950 PRINT "Choose your skill level"
2960 PRINT
2970 PRINT CHR$ (130);"1. Easy
             - two balls"
2980 PRINT CHR$ (130);"2. Hard
             - four balls"
2990 PRINT CHR$ (130);"3. Impossible
        - invisible maze"
3000 PRINT ''
3010 PRINT "When using the invisible
      maze press"
3020 PRINT "key 'M' to make the maze
      visible"
3030 PRINT ''
3040 PRINT CHR$ (130);"CHOOSE 1,2
      or 3.  ";
3050 *FX21,0
3060 REPEAT
     :C$=INKEY$ (0)
     :PROCMUSIC
     :UNTIL C$="1" OR C$="2"
     OR C$="3"
3070 C%=VAL (C$)
3080 IF C%=1
     THEN L%=2
     ELSE L%=4
3090 ENDPROC
3100 REM MUSIC DATA
3110 DATA 69,2,77,1,69,1,65,1,57
     ,1,49,2,37,2,57,2,29,2,17,2
     ,49,2,57,1,49,1,57,1,65,1,69
     ,2,69,2,77,1,69,1,65,1,57,1
3120 DATA 49,2,37,2,57,2,29,2,17
     ,2,49,2,57,6,69,2,69,2,69,2
     ,45,2,45,2,45,2,77,2,77,2,77
     ,2
3130 DATA 65,2,65,1,69,1,65,2,85
     ,2,85,1,77,1,85,2,45,2,45,1
     ,37,1,45,2,65,2,57,2,49,2,49
     ,2,57,4
3140 DEF PROCMUSIC
     :CALL &D00
     :IF ?&70=0 ENDPROC
3150 Q%=Q%+1
     :IF Q%=55 Q%=1
3160 SOUND 1,2,N%(Q%)+100,D%(Q%)*3
     :SOUND 2,3,N%(Q%)+80,D%(Q%)*3
     :ENDPROC
```

This listing is included in this month's cassette tape offer. See order form on Page 193.

CLEARLY HE HAD ONLY ONE KEYBOARD IN MIND WHEN HE DESIGNED THE HUMAN HAND



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Just think how effortless it would be if you could *touch type* your programs, data and text.

How you could lean back and relax; be faster and more accurate; your mind free to think, and your eyes to read.

IT'S CALLED QUINKEY

And for **£49.95** you'll get everything you need — hardware and software — to use Quinkey with your BBC computer.

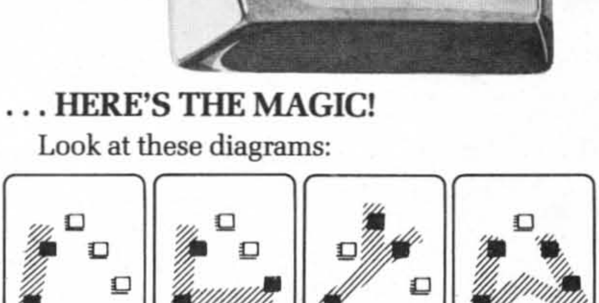
HOW CAN 6 KEYS DO THE WORK OF 72?

You simply press the keys in different combinations. Each combination represents a character.

Quinkey has 5 keys plus a Control key, each finger belonging to its own key — so there's no need to hunt and peck . . . BUT . . .

. . . HERE'S THE MAGIC!

Look at these diagrams:



See how the lines joining the key combinations form the characters? For each letter there's an instantly recognised and easily memorised visual clue.

That's the trick — and it works!

YOU CAN TRY IT NOW!

Rest the fingers of your right hand on a table top. Imagine the keys.

To write an "I" you press your Thumb and Index finger down at the same time.

For an "L" you press your Thumb, Index and Little fingers.

To write "Y" you use your Thumb, Middle and Ring fingers . . . and so on.

That's all there is to it.

Here's what users are saying about the keyboard:

– PETER RODWELL (as Editor of 'Personal Computer World') "took me half an hour to learn the alphabet . . . far easier than learning to type. It's an addictive device, and I'm starting to wonder how I ever managed without one."

– PETER WHEELER (in the 'Times Educational Supplement') "a new user can start to touch type after one hour's usage."

– FRANK DALE (BBC Producer – writing in 'Electronic Times') "no other machine is so easy to use, so easy to learn, so generally useful . . ."

NO RISK, MONEY BACK GUARANTEE.

If you're unhappy with your Quinkey just return it within two weeks for a full and courteous refund.

ONLY £49.95 (including VAT and postage & packing). HERE'S WHAT YOU GET.

- ★ One Quinkey keyboard.
- ★ Breakthrough multi-channel interface for up to four keyboards (plug into analogue port).
- ★ Two new powerful software packages, PROG & WP (described below).
- ★ Comprehensive Quinkey manual.

"PROG" and "WP" (free with the Quinkey package) are utility programs written specially for the BBC.

"PROG" enables your BBC to recognise and interpret the signals from the Quinkey keyboard. It combines easily with your application programs enabling you to use Quinkey as a comprehensive alternative keyboard.

"WP" optimises Quinkey to work with word-processing packages "Wordwise," "View" and "Edword" – a perfect text-writing combination.

KEYBOARD RANGE.

All BBC "B" keyboard inputs generate from the Quinkey, except the hard-wire key, "Break."

TECHNICAL DATA:
Loading length: &605. Running length: &300.
No zero-page locations, all ADC channels.
Interrupt service vector IRQ2V, correctly chained.

TESTED COMPATIBILITY

BBC Model "B"	Acorn
OS 1.2	
BASIC I or BASIC II (unless using INKEY with negative argument)	Acorn
DFS 0.90	Acorn
View A1.4	Acornsoft
Wordwise 1.17	Computer Concepts
Edword	Clwyd Technics

QUINKEY IN THE CLASSROOM.

Quinkey keyboards allow up to four children to use one BBC computer at the same time. "QUAD" software supplied with the Educational Pack enables children to write simultaneously on a split screen and print out their work separately.

(Send the coupon if you would like more information about the remarkable results that children of all ages and abilities are having with Quinkey.)

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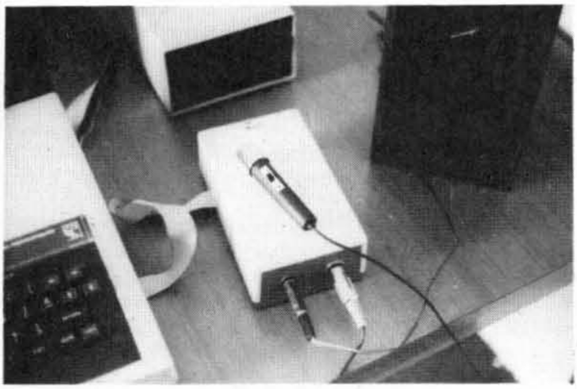

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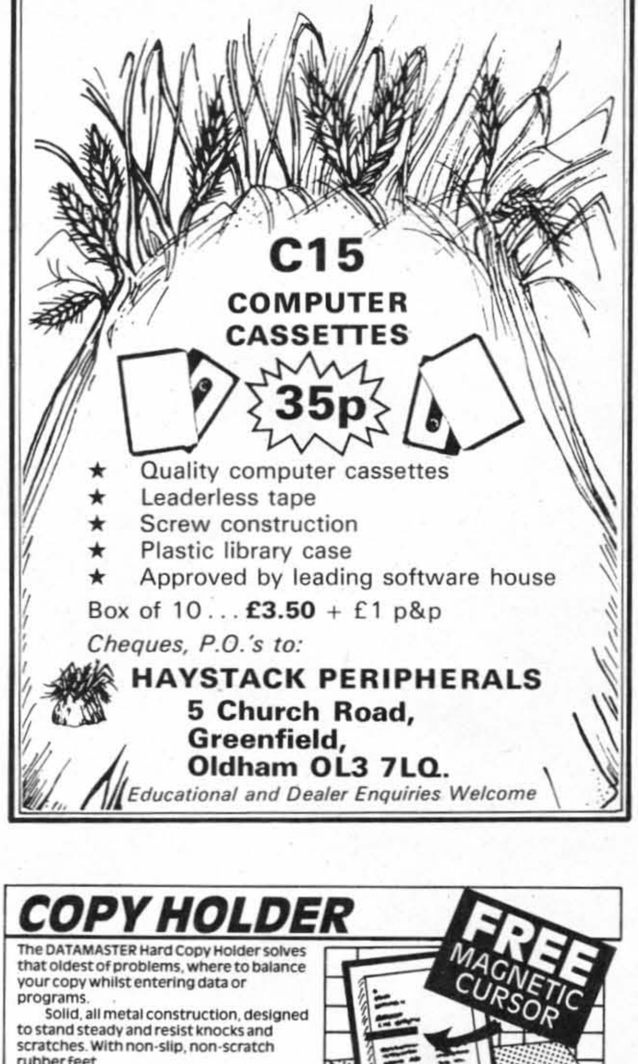
Tel: (0273) 606860



C15

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A new concept in ROM based software for the BBC MICRO

Features include:

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- Creates a LIBRARY of up to 399 "members" per 80 track disk or up to 199 "members" per 40 track disk.
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- Includes comprehensive manual and fitting instructions.
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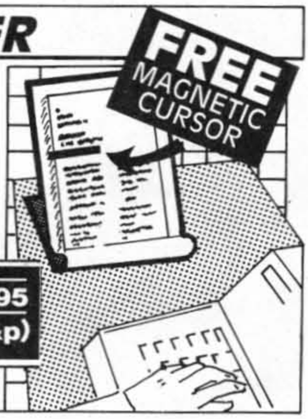

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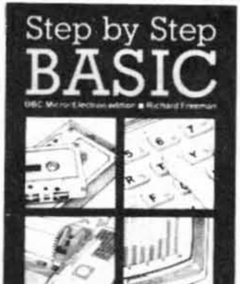

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Villains listing

From Page 99

```
    5 REM (c) The Micro User
   10 *FX9,8
   20 *FX10,8
   30 PROCinit
   40 ONERRORMODE7:PROCerr
   50 MODE7:PROCinstruct:MODE2:VDU23;
8202;0;0;0;:VDU5
   60 PROCvar:PROCscreensetup:REPEAT:
R%=RND(4):PROCscore
   70 IFR%=1PROCvillain(16,4)
   80 IFR%=2PROCvillain(24,2)
   90 IFR%=3PROCassasin
  100 IFR%=4PROChugo
  110 IFmen%<0GOSUB1000
  120 IFkilled%=0PROCwave
  130 UNTILFALSE
  140 DEFPROCvar:FORcol%=1TO4:gold%(c
ol%)=1:NEXT:goldpos%(1,1)=616:goldpos
%(1,2)=638:goldpos%(2,1)=806:goldpos%
(2,2)=448:goldpos%(3,1)=616:goldpos%(
3,2)=258:goldpos%(4,1)=426:goldpos%(4
,2)=448
  150 xpos%(1)=1060:xpos%(2)=156:ypos
%(1)=220:ypos%(2)=739:X%=640:Y%=448:R
%=RND(4):men%=7:print%=1:score%=0:hug
o%=36:speed%=32:C%=speed%:killed%=13:
wave%=0:dist%=360:ENDPROC
  160 DEFPROCscreensetup:GCOL0,4:MOVE
100,795:DRAW1180,795:DRAW1180,100:DRA
W100,100:DRAW100,795:GCOL0,1:MOVE100,
1000:DRAW1180,1000:DRAW1180,800:DRAW1
00,800:DRAW100,1000:VDU24,108;108;117
2;787;:PROCbars:VDU4:COLOUR4
  170 PRINTTAB(2,2);"SCORE:";TAB(2,5)
;"ENERGY:":COLOUR1:FORcol%=9TO16:PRIN
TTAB(col%,5);CHR$250:NEXT:VDU5:ENDPRO
C
  180 DEFPROCkey:PROCbar
  190 IF(?&EC OR?&ED)=0PROCman:ENDPRO
C
  200 IFINKEY(-98)C%=-speed%:PROCmove
x
  210 IFINKEY(-67)C%=speed%:PROCmovex
  220 IFINKEY(-88)D%=speed%:PROCmovey
  230 IFINKEY(-104)D%=-speed%:PROCmov
ey
  240 IFINKEY(-99)PROCgun
  250 ENDPROC
  260 DEFPROCmovex:IF(X%+C%)>1108OR(X
%+C%)<108ENDPROC
  270 PROCwipe(X%,Y%):X%=X%+C%:PROCma
n:ENDPROC
  280 DEFPROCmovey:IF(Y%+D%)>787OR(Y%
+D%)<172ENDPROC
  290 PROCwipe(X%,Y%):Y%=Y%+D%:PROCma
n:ENDPROC
  300 DEFPROCgun:SOUND17,4,230,29:SOU
ND16,-15,7,29:FORcol%=4TO0STEP-4:MOVE
(X%+32)+(SGN(C%)*32),(Y%-24):GCOL3,1:
PLOT1,SGN(C%)*1030,0:PROCdelay(col%):
NEXT:IFABS((Y%-26)-(y%-32))<32AND(SGN
(x%-X%)=SGN(C%))R%=0
  310 ENDPROC
  320 DEFPROCvillain(step%,colour%):B
%=1:REPEAT:col%=RND(4):U%=goldpos%(co
l%,1):V%=goldpos%(col%,2):UNTILgold%(
col%)>0:var%=col%:col%=RND(2):x%=xpos
%(col%):col%=RND(2):y%=ypos%(col%):A%
=2:REPEAT
  330 IFA%=3col%=RND(2):U%=xpos%(col%
):col%=RND(2):V%=ypos%(col%):VDU25,4,
goldpos%(var%,1);goldpos%(var%,2);18,
0,0,250:gold%(var%)=0:A%=4
  340 PROChome:IFmen%>=0PROCkey
  350 IFA%=4ANDABS(U%-x%)<=48ANDABS(V
%-y%)<=48B%=0
  360 UNTILR%=0OR B%=0 OR men%<0:PROC
wipe(x%,y%):IFR%=0score%=score%+80:ki
lled%=killed%-1:IFR%=0ANDA%=4VDU25,4,
x%;y%-32;18,0,8,251,8,18,0,15,252:gol
dpos%(var%,1)=x%:goldpos%(var%,2)=y%-
32:gold%(var%)=1
  370 IFB%=0U%=0:FORcol%=1TO4:U%=U%+g
old%(col%):NEXT:IFU%=0men%=-2
  380 ENDPROC
  390 DEFPROChome:PROCwipe(x%,y%):x%=
x%+(SGN(U%-x%)*(step%*A%DIV2)):y%=y%+
(SGN(V%-y%)*(step%*A%DIV2)):VDU25,4,x
%;y%;:IFA%=2PROCvdu ELSEPROCvdu1
  400 col%=RND(17):IFcol%=8PROCshoot
  410 IFA%=2ANDABS((U%+12)-(x%+32))<4
4ANDABS((V%-8)-(y%-32))<40A%=3
  420 ENDPROC
  430 DEFPROCvdu:VDU18,0,colour%,244,
8,18,0,3,245,8,18,0,1,246,10,8,18,0,c
olour%,247,8,18,0,1,248:ENDPROC
  440 DEFPROCvdu1:VDU18,0,colour%,244
,8,18,0,3,245,8,18,0,1,246,10,8,18,0,
8,251,8,18,0,15,252,8,18,0,1,253,8,18
,0,colour%,254:ENDPROC
  450 DEFPROCshoot:spare1%=(31-RND(62
))*8:FORcol%=5TO0STEP-5:MOVE(x%+32),(
y%-16):GCOL3,5:SOUND&10,0,0,5:SOUND&1
1,1,255,5:DRAW(X%+32)+spare1%,(Y%-32)
+spare1%:PROCdelay(col%):NEXT:IFABSsp
are1%<32PROChit
  460 ENDPROC
  470 DEFPROChit:men%=men%-1:VDU19,0,
7;0;:VDU4:COLOUR0:PRINTTAB(10+men%,5)
;CHR$250:VDU5
  480 VDU19,0,0;0;:ENDPROC
  490 DEFPROCdelay(a%):TIME=0:REPEATU
NTILTIME>a%:ENDPROC
  500 DEFPROCassasin:y%=Y%:A%=0:IFX%>
=640x%=120:B%=40ELSEx%=1118:B%=-40
  510 U%=x%:spare1%=x%:REPEAT:IFABS(s
pare1%-x%)<dist%ANDA%=0PROCrun ELSE P
ROCfire
  520 IFmen%>=0PROCkey
  530 UNTILABS(U%-x%)<40ORR%=0ORmen%<
0:PROCwipe(x%,y%):IFR%=0score%=score%
+100:killed%=killed%-1
  540 ENDPROC
  550 DEFPROCassass:VDU25,4,x%;y%;18,
0,4,229+(5*SGN(B%)),8,18,0,7,230+(5*S
GN(B%)),8,18,0,1,231+(5*SGN(B%)),10,8
,18,0,4,232+(5*SGN(B%)),8,18,0,1,233+
(5*SGN(B%)):ENDPROC
  560 DEFPROCrun:PROCwipe(x%,y%):x%=x
%+B%:PROCassass:ENDPROC
  570 DEFPROCfire:IFA%=0A%=RND(5)+5
  580 col%=SGN(2-(RND(5)-1))*16:IFABS
((y%+col%)-480))>306col%=0
  590 PROCwipe(x%,y%):y%=y%+col%:PROC
assass:SOUND&10,2,6,4:FORcol%=4TO0STE
P-4:MOVEx%+32+(SGN(B%)*32),y%-28:GCOL
3,5:PLOT1,SGN(B%)*640,0:PROCdelay(col
%):NEXT:IFABS((y%-26)-(Y%-32))<32PROC
hit
  600 A%=A%-1:IFA%=0B%=-B%:spare1%=sp
are1%-(SGN(B%)*40)
  610 ENDPROC
  620 DEFPROCgameover:PROCdelay(70):S
OUND17,5,230,91:SOUND16,-15,7,91:IFme
n%=-2VDU4:COLOUR0:FORcol%=9TO16:PRINT
TAB(col%,5);CHR$250:NEXT:VDU5
  630 FORcol%=1TO90:MOVEX%+32,Y%-32:R
EPEAT:var%=RND(3):UNTILvar%<>2:GCOL0,
var%:DRAWRND(1000),RND(1000):NEXT:PRO
Cdelay(425):ENDPROC
```

→

Villains listing

From Page 161

```
640 DEFPROCman:VDU25,4,X%;Y%;18,0,7
,234+(5*SGN(C%)),8,18,0,1,235+(5*SGN(
C%)),8,18,0,3,236+(5*SGN(C%)),8,18,0,
4,237+(5*SGN(C%)),10,8,18,0,1,238+(5*
SGN(C%)):ENDPROC
650 DEFPROCbar:IFgold%(print%)=0GOT
O660ELSEVDU25,4,goldpos%(print%,1);go
ldpos%(print%,2);18,0,8,251,8,18,0,15
,252
660 print%=print%+1:IFprint%=5print
%=1
670 ENDPROC
680 DEFPROChugo:B%=1:A%=hugo%:V%=16
:col%=RND(2):IFcol%=1x%=150ELSEx%=106
6
690 IFY%>=450y%=Y%-(RND(3)*75)ELSEy
%=Y%+(RND(3)*75)
700 REPEAT:IFA%>0A%=A%-1ELSEA%=-1:V
%=SGN(Y%-y%)*40
710 PROCmovehugo:IFB%>0PROCkey
720 UNTILB%=0OR R%=0:PROCwipe(x%,y%
):IFB%=0ANDspeed%>4speed%=speed%-7
730 IFR%=0score%=score%+50:killed%=
killed%-1
740 ENDPROC
750 DEFPROCmovehugo:IFA%>0V%=-V%
760 IFABS((Y%-32)-(y%-32))<32ANDA%<
=0PROChugofire
770 PROCwipe(x%,y%):y%=y%+V%:VDU25,
4,x%;y%;18,0,7,249,8,18,0,4,255,8,18,
0,1,246,10,8,18,0,4,247,8,18,0,1,248:
ENDPROC
780 DEFPROChugofire:SOUND&10,0,0,5:
SOUND&11,3,200,10:FORcol%=12TO0STEP-1
2:VDU25,4,x%+32;y%-32;25,4,X%;Y%+10;:
GCOL3,2:PLOT85,X%,Y%-74:PROCdelay(col
%):NEXT:B%=0:ENDPROC
790 DEFPROCwave:X%=640:Y%=448:wave%
=wave%+1:killed%=13+(wave%*2):CLG:MOV
E450,700:GCOL0,RND(6):PRINT"WAVE ";wa
ve%:MOVE370,600:PRINT"COMPLETED":U%=0
:FORcol%=1TO4:IFgold%(col%)=1 U%=U%+1
800 IFhugo%>0hugo%=hugo%-2
810 NEXT:MOVE370,500:PRINT"BONUS x
";U%:score%=score%+(RND(4)*100*U%):FO
Rcol%=1TOU%:MOVE365+(col%*100),400:VD
U18,0,8,251,8,18,0,15,252:NEXT:IFdist
%>40dist%=dist%-40
820 IF(wave%/3)=INT(wave%/3)ANDmen%
<7 GCOL0,12:MOVE400,300:PRINT"+ ENERG
Y":men%=7:speed%=32:VDU4:COLOUR1:FORc
ol%=9TO16:PROCdelay(5):PRINTTAB(col%,
5);CHR$250:NEXT:VDU5
830 PROCdelay(500):CLG:PROCman:PROC
bars:ENDPROC
840 DEFPROCscore:VDU4:COLOUR1:PRINT
TAB(9,2);score%:VDU5:ENDPROC
850 DEFPROCbars:FORcol%=1TO4:IFgold
%(col%)=1VDU25,4,goldpos%(col%,1);gol
dpos%(col%,2);18,0,8,251,8,18,0,15,25
2
860 NEXT:ENDPROC
870 DEFPROChitable
880 *FX15,0
890 VDU23;8202;0;0;0;:IFscore%<HI%(
5) GOTO950
900 U%=0:REPEAT:U%=U%+1:UNTILscore%
>=HI%(U%)
910 IFU%=5 GOTO930
920 FORcol%=5TO U%STEP-1:HI%(col%)=
HI%(col%-1):HI$(col%)=HI$(col%-1):NEX
T
930 HI%(U%)=score%:PRINT'CHR$130"YO
U ARE RANKED NUMBER ";U%;''CHR$129"WE
LL DONE!":INPUT'"PLEASE TYPE IN YOUR
 NAME..",A$:IFLEN(A$)>8 A$=LEFT$(A$,8
)
940 HI$(U%)=A$
950 CLS:A$=CHR$132+CHR$157+CHR$129+
CHR$141+CHR$130+"     VILLAINS HALL O
F FAME":PRINTTAB(0,3);A$;TAB(0,4);A$
960 FORcol%=1TO5:PRINTTAB(9,col%+8)
;CHR$(128+RND(6));HI%(col%);STRING$(2
0-(LEN(HI$(col%))+LEN(STR$(HI%(col%))
)),".");HI$(col%):NEXT:PRINTTAB(9,17)
;CHR$133"Another Game ? (Y/N)"
970 A$=GET$:IFINSTR("YyNn",A$)=0VDU
7:GOTO970
980 CLS:IFA$="N" OR A$="n"END ELSE
ENDPROC
990 DEFPROCwipe(a%,b%):VDU25,4,a%;b
%;18,0,0,250,10,8,250:ENDPROC
1000 PROCgameover:MODE7:PROChitable:
PROCinstruct:MODE2:VDU23;8202;0;0;0;:
VDU5:PROCvar:PROCscreensetup:RETURN
1010  DEFPROCinstruct:A$=CHR$132+CHR
$157+CHR$129+CHR$141+CHR$130+"
   VILLAINS":PRINTTAB(0,3);A$;TAB(0,
4);A$;TAB(15,6)CHR$129"KEYS:";TAB(13
,10)CHR$133"Z...LEFT";TAB(13,12)CHR$
133"X...RIGHT"
1015 PRINTTAB(13,14)CHR$133"+...UP"
;TAB(13,16)CHR$133">...DOWN"
1020  PRINTTAB(13,18)CHR$133"<SPACE>
...FIRE";TAB(7,21)CHR$129;CHR$136"PR
ESS <SPACE> TO START":REPEATUNTILGET
$=" ":ENDPROC
1030 DEFPROCerr:IFERR<>17 REPORT:PRI
NT" at line ";ERL:END
1040 ENDPROC
1050 DEFPROCinit:DIMgold%(4),goldpos
%(4,2),xpos%(2),ypos%(2),HI%(5),HI$(5
):FORcol%=2TO5:HI$(col%)="DBT":HI%(co
l%)=1000::NEXT:HI$(1)="DEREKDBT":HI%(
1)=10000
1060 VDU23,224,96,176,96,32,48,120,8
8,24,23,225,0,64,0,0,0,0,0,23,226,0
,0,0,0,0,166,227,23,227,48,48,112,9
6,96,96,96,224,23,228,64,8,12,6,3,1,1
,0,23,229,14,31,31,14,0,0,0,8,23,230,
0,0,0,0,4,12,14,0,23,231,0,0,0,0,0,3,
1,7
1070 VDU23,232,0,0,0,0,0,240,16,23
,233,14,26,50,34,34,34,34,230,23,234,
6,13,6,4,12,30,26,24,23,235,0,2,0,0,0
,0,0,0,23,236,0,0,0,0,0,101,199,23,
237,12,12,14,6,6,6,6,7,23,238,2,16,48
,96,192,128,128,0,23,239,112,248,248,
112,0,0,0,16
1080 VDU23,240,0,0,0,0,32,48,112,0,2
3,241,0,0,0,0,0,192,128,224,23,242,0,
0,0,0,0,0,15,8,23,243,112,88,76,68,68
,68,68,103,23,244,62,127,0,0,0,8,28,2
8,23,245,0,0,42,62,28,0,0,0,23,246,0,
0,0,0,0,0,0,99,23,247,28,8,28,20,20,2
0,20,54
1090 VDU23,248,65,119,0,0,0,0,0,0,23
,249,28,62,42,62,28,0,0,0,23,250,255,
255,255,255,255,255,255,255,23,251,28
,20,28,0,0,0,0,0,23,252,0,8,0,0,0,0,0
,0,23,253,65,99,0,0,0,0,0,0,23,254,0,
0,0,20,20,20,20,54,23,255,0,0,20,0,0,
8,28,28
1100 ENVELOPE1,129,-15,-8,-3,10,10,1
0,126,0,0,-126,126,126:ENVELOPE2,1,0,
0,0,0,0,0,126,-1,0,-3,126,126:ENVELOP
E3,1,4,-4,4,2,4,2,127,0,0,-5,126,126:
ENVELOPE4,1,-1,0,0,145,0,0,10,0,0,-10
,10,0:ENVELOPE5,3,-1,0,0,150,0,0,10,0
,0,-10,10,0:ENDPROC
```

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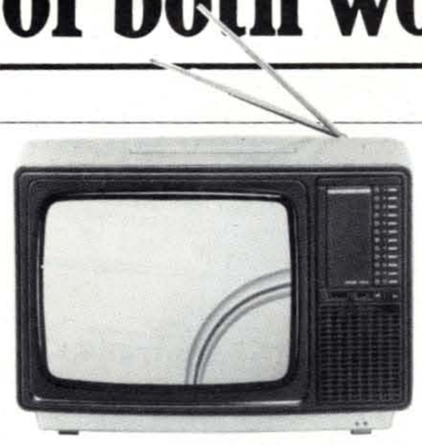

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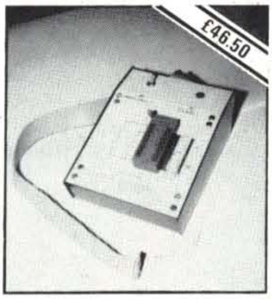
FOR THE BBC



A very high quality product direct from the manufacturers, contained in attractive sloping box with low insertion force socket and neon indicator for programming fitted as standard, the software adopts the high efficiency method for programming 2764 and 27128. This allows up to 100% faster programming, software in machine code, supplied on cassette and can be placed in eprom. Very easy to use, menu driven with easy to use instructions. This unit is completely self contained with its own power supply and plugs into the user port.

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1. Will program: 2716, 2732, 2532, 2764 and 27128 eproms.
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ELECTRONIC SERVICES

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... that's the number you'll need for Microweb, the most exciting bulletin board around for the BBC Micro.

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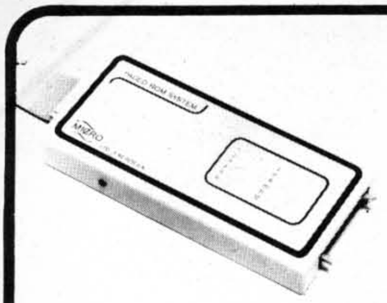
Please allow 28 days for delivery

Micro Term listing

From Page 117

```
  940 .check_for_end
  950 LDA buffpointl
  960 CMP bufftopl
  970 LDA buffpointh
  980 SBC bufftoph
  990 RTS
 1000 .storechar
 1010 LDY #0
 1020 STA (bufftopl),Y
 1030 JSR increment_store
 1040 RTS
 1050 .fetchchar
 1060 LDY #0
 1070 LDA (buffpointl),Y
 1080 PHA
 1090 JSR increment_pointer
 1100 PLA
 1110 RTS
 1120 .keyboard_scan
 1130 LDA #145
 1140 LDX #0
 1150 LDY #0
 1160 JSR OSBYTE
 1170 BCS nokey
 1180 TYA
 1190 CMP #128
 1200 BCC not_fkey
 1210 BEQ fkey0
 1220 CMP #129
 1230 BEQ fkey1
 1240 CMP #130
 1250 BEQ fkey2
 1260 CMP #131
 1270 BEQ fkey3
 1280 SEC
 1290 RTS
 1300 .not_fkey
 1310 CLC
 1320 RTS
 1330 .fkey0 \ toggle copy to buffer
 1340 LDA buffer_flag
 1350 EOR #1
 1360 STA buffer_flag
 1370 PHA
 1380 JSR toscreen
 1390 LDY #0
 1400 PLA
 1410 BNE on
 1420 .off
 1430 LDA bufferoff,Y
 1440 JSR OSASCI
 1450 INY
 1460 CMP #13
 1470 BNE off
 1480 SEC
 1490 RTS
 1500 .on
 1510 LDA bufferon,Y
 1520 JSR OSASCI
 1530 INY
 1540 CMP #13
 1550 BNE on
 1560 SEC
 1570 RTS
 1580 .fkey1 \ output buffer
 1590 JSR send_buffer
 1600 SEC
 1610 RTS
 1620 .fkey2
 1630 LDA #0
 1640 STA operand
 1650 JMP filing
 1660 .fkey3
 1670 LDA #&FF
 1680 STA operand
 1690 .filing
 1700 JSR fileop
 1710 LDA #7
 1720 JSR OSWRCH
 1730 SEC
 1740 RTS
 1750 .nokey
 1760 SEC
 1770 RTS
 1780 .send_buffer
 1790 JSR toRS423
 1800 LDA buffstartl
 1810 STA buffpointl
 1820 LDA buffstarth
 1830 STA buffpointh
 1840 .output_loop
 1850 JSR wait
 1860 JSRfetchchar
 1870 BCS allsent
 1880 JSR OSWRCH
 1890 .check_xon_xoff
 1900 JSR getchar
 1910 BCS endcheck
 1920 .char_received
 1930 CMP #17
 1940 BNE xoff
 1950 LDX #0
 1960 STX xon_xoff_status
 1970 .xoff
 1980 CMP #19
 1990 BNE nocode
 2000 LDX #1
 2010 STX xon_xoff_status
 2020 .nocode
 2030 JSR display
 2040 .endcheck
 2050 LDX xon_xoff_status
 2060 BNE check_xon_xoff
 2070 JSR toRS423
 2080 JMP output_loop
 2090 .allsent
 2100 RTS
 2110 .toRS423
 2120 LDA #3
 2130 LDX #7
 2140 JSR OSBYTE
 2150 RTS
 2160 .toscreen
 2170 LDA #3
 2180 LDX #4
 2190 JSR OSBYTE
 2200 RTS
 2210 .display
 2220 PHA
 2230 JSR toscreen
 2240 PLA
 2250 JSR OSWRCH
 2260 RTS
 2270 .fileop
 2280 JSR toscreen
 2290 LDA #12
 2300 JSR OSWRCH
 2310 LDY #0
 2320 .prompt
 2330 LDA filename,Y
 2340 JSR OSASCI
 2350 INY
 2360 CMP #13
 2370 BNE prompt
 2380 LDA #inputbuffer MOD 256
 2390 STA fileblock
 2400 STA paramblock
 2410 LDA #inputbuffer DIV 256
 2420 STA fileblock+1
 2430 STA paramblock+1
 2440 LDA #18
 2450 STA paramblock+2
 2460 LDA #32
 2470 STA paramblock+3
 2480 LDA #127
 2490 STA paramblock+4
 2500 LDX #paramblock MOD 256
 2510 LDY #paramblock DIV 256
 2520 LDA #0
 2530 JSR OSWORD
 2540 .zeroblock
 2550 LDY #2
 2560 LDA #0
 2570 .zeroloop
 2580 STA fileblock,Y
 2590 INY
 2600 CPY #&12
 2610 BCC zeroloop
 2620 LDA buffstartl
 2630 STA fileblock+2
 2640 STA fileblock+10
 2650 LDA buffstarth
 2660 STA fileblock+3
 2670 STA fileblock+11
 2680 LDA bufftopl
 2690 STA fileblock+14
 2700 LDA bufftoph
 2710 STA fileblock+15
 2720 LDX #fileblock MOD 256
 2730 LDY #fileblock DIV 256
 2740 LDA operand
 2750 PHA
 2760 JSR OSFILE
 2770 PLA
 2780 BEQ out
 2790 LDA buffstartl
 2800 CLC
 2810 ADC fileblock+10
 2820 STA bufftopl
 2830 LDA buffstarth
 2840 ADC fileblock+11
 2850 STA bufftoph
 2860.out
 2870 RTS
 2880 .inputbuffer
 2890 ]
 2900 P%=P%+20
 2910 [OPT opt%
 2920 .fileblock
 2930 ]
 2940 P%=P%+20
 2950 [OPT opt%
 2960 .paramblock
 2970 ]
 2980 P%=P%+6
 2990 [OPT opt%
 3000 .filename
 3010 ]
 3020 $P%="Filename ?"
 3030 P%=P%+LEN($P%)+1
 3040[OPT opt%
 3050 .bufferon
 3060 ]
 3070 $P%="Buffer On"
 3080 P%=P%+LEN($P%)+1
 3090 [OPT opt%
 3100 .bufferoff
 3110 ]
 3120 $P%="Buffer Off"
 3130 P%=P%+LEN($P%)+1
 3140 NEXT opt%
 3150 END
```

This listing is included in this month's cassette tape offer. See order form on Page 193.



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STAR GAZER
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From Page 59

```
460 VDU 23,230,0,8,28,42,8,8,8
    ,0
470 VDU 23,231,0,0,0,127,0,0,0
    ,0
480 VDU 23,232,64,64,64,66,70,10
    ,30,2
490 VDU 23,233,20,20,20,20,20,20
    ,20,0
500 VDU 23,234,96,16,96,18,102
    ,10,30,2
510 VDU 23,235,0,8,0,127,0,8,0
    ,0
520 VDU 23,236,0,252,252,252,252
    ,252,252,0
530 PROCassem
540 ENDPROC
550
560 DEF PROCsetline
570 IF Y%>setline+1 OR top=FALSE
    THEN top=TRUE
    :bottom=FALSE
    :setline=Y%
580 IF Y%=setline+1 AND top=
    TRUE
    THEN top=FALSE
    :bottom=TRUE
590 ENDPROC
600
610 DEF PROCgraph(c%)
620 LOCAL L1,L3,L4,L5,L6,L8,s%
630 IF c%=96
    THEN c%=35
    ELSE IF c%=95
    THEN c%=96
640 c%=(c%AND &7F)-32
650 IF c%>=64
    THEN L6=&F
    :c%=c%-64
660 IF c%>=16
    THEN L6=L6+&F0
    :c%=c%-16
670 L8=L6
680 IF c%>=8
    THEN L4=&F
    :c%=c%-8
690 IF c%>=4
    THEN L4=L4+&F0
    :c%=c%-4
700 L5=L4
710 IF c%>=2
    THEN L1=&F
    :c%=c%-2
720 IF c%=1
    THEN L1=L1+&F0
730 L3=L1
740 IF separate=TRUE
    THEN L3=0
    :L5=0
    :L8=0
    :L1=L1 AND &EE
    :L4=L4 AND &EE
    :L6=L6 AND &EE
750 VDU 23,226,L1,L1,L3,L4,L5,L6
    ,L6,L8
760 s%=&C10
770 PROCoutput(s%)
780 ENDPROC
790
800 DEF PROCdiff(c%)
810 c%=c%AND &7F
820 c%=c%-90
    :IF c%>5
    THEN c%=c%-27
    :IF c%>10
    THEN c%=10
830 s%=(&C10+c%*8)
840 PROCoutput(s%)
850 ENDPROC
860
870 DEF PROCprint(c%)
880 c%=c%AND &7F
890 s%=b%+(c%-32)*8
900 PROCoutput(s%)
910 ENDPROC
920
930 DEF PROCexpand(s%)
940 IF bottom=TRUE
    THEN s%=s%+4
950 FOR K%=0TO 3
    :K%?(m%+K%)=K%?s%
    :K%?(m%+1+K%)=K%?s%
    :NEXT
960 ENDPROC
970
980 DEF PROCoutput(s%)
990 IF double=TRUE
    THEN PROCexpand(s%)
    :s%=&C08
1000 !&80=s%
1010 !&82=p%
1020 CALL &C90
1030 FOR L%=0TO 7
    :VDU 1,L%?&C00
    :NEXT
1040 ENDPROC
1050
1060 DEF PROCassem
1070 code%=&C90
1080 source=&80
1090 dest=&82
1100 loc=&84
1110 bit=&85
1120 put=&86
1130 off=&87
1140 table=&88
1150 FOR pass=0TO 2 STEP 2
1160 P%=code%
1170 [OPT pass
1180 LDY#7
1190 LDA#0
1200 .clear STA (dest),Y
1210 DEY
1220 BPL clear
1230 LDX#8
1240 LDA#128
1250 .init STA table-1,X
1260 LSR A
1270 DEX
1280 BNE init
1290 LDA#&FF
1300 STA off
1310 LDA#7
1320 STA loc
1330 .outer
1340 LDA#7
1350 STA bit
1360 LDA#&FF
1370 STA put
1380 INC off
1390 .inner
1400 INC put
1410 LDY loc
1420 LDX bit
1430 LDA (source),Y
1440 AND table,X
1450 BEQ next
1460 LDX off
1470 LDA table,X
1480 LDY put
1490 OR A (dest),Y
1500 STA (dest),Y
1510 .next DEC bit
1520 LDA bit
1530 BPL inner
1540 DEC loc
1550 LDA loc
1560 BPL outer
1570 RTS
1580 ]
1590 NEXT
1600 ENDPROC
1610
1620 DEF PROCload
1630 CLS
1640 INPUT ''"Dump which file "
    ,file$
1650 $cmd%="LOAD "+file$+" 7C00"
1660 X%=cmd%
    :Y%=cmd%DIV 256
1670 CALL &FFF7
1680 ENDPROC
```

This listing is included in this month's cassette tape offer. See order form on Page 193.

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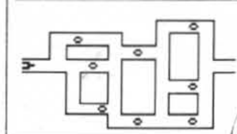

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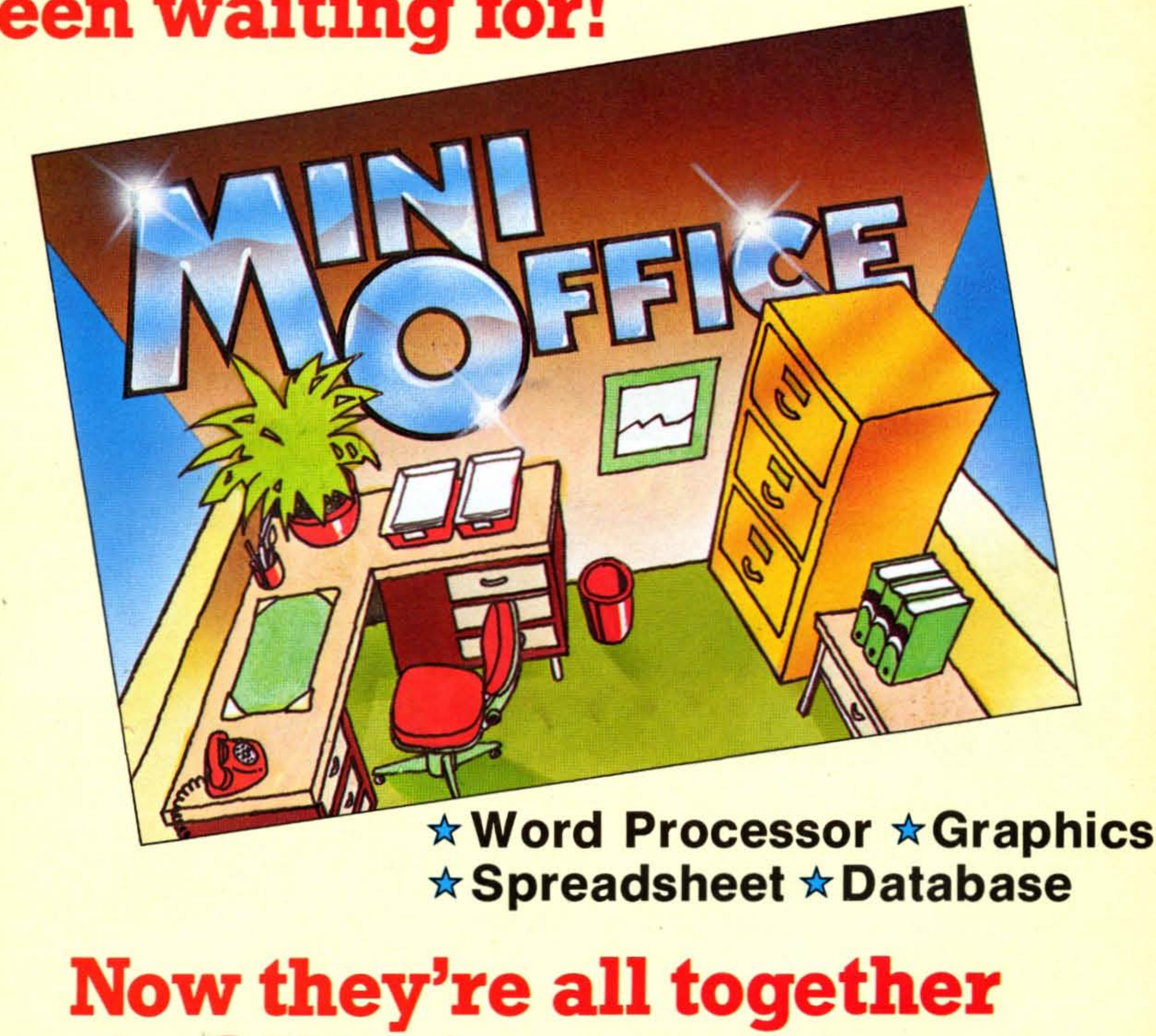

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MICROMAIL

Improved performance of &7F OSWORD

I WAS very interested to read details of the &7F OSWORD call to the DFS, in the article by Miles Gooby in your June 1984 issue.

Having found that the performance of disc transfers from Basic is well below that which should be possible, I hoped that this was a solution.

Unfortunately it wasn't, but I have discovered why the performance is so low. Even better, I have found a method of improving the performance of the &7F OSWORD in many circumstances. (This applies to DFS 0.90).

If you time &7F calls, you find that any action takes about half a second, regardless of circumstance. For example, to read one sector (averaged over many tries, without seeking) takes 460 milliseconds.

Even more ludicrous, the read drive status command (&67, no parameters) takes 400 msec, and this is a purely electronic operation!

As stated in the article, multisector operations are more efficient, and the time increases only a little for each additional sector.

Clearly each DFS call is imposing an overhead of about 400 msec, and that is a lot of code.

After digging about in the DFS, I found that on each call the drive and head are selected, and the DFS loops until the drive becomes ready.

Now "ready" depends on a circuit (ICs 83, 84, 85) which sets a delay of .25 sec and then waits until the index hole passes by.

This allows the motor to come to speed, and the drive remains ready so long as the disc is rotating.

Fine if the drive was stopped when you called the DFS. But this circuit, and the delay loop, is triggered for every DFS call, even if the disc is still running on from the previous transfer.

The correct logic would be not to do the select if the drive number were unchanged and the drive was still ready.

Now the good news. If you set the drive number in an fcb to a negative value (that is 128 to 255), then all this code is bypassed and the previously selected drive is used.

Thus the drive number need only be set if it is the first access to the drive or after any action which might access another drive or the drive might have stopped.

Actually the last case is easy to deal with, because you get the error &10, "Drive Not Ready", – so retry with the drive number set. The gains can be well worth while.

If you alter the verify code to set the drive only on the first transfer, it runs three times faster.

I was interested in searching files for the presence of character strings (with only a single sector buffer available).

This reduced immediately from 460 msec per sector to 220 msec average. However for specific applications like this it was worth formatting the disc with an interleave factor. Then the time reduced to 62 msec per sector, more than seven times faster.

Interleaving is a method of formatting the disc with the sectors out of order. For example, if sectors are formatted in the order 0741852963 instead of 0123456789, there are 2 sectors interleaved between every successive pair.

The idea is that your program can read a sector, do some work on it, and come back for the next one just as it is approaching the head.

The 8271 is quite happy to find the sectors out of order. The interleave factor must be tuned to the application. Multisector operations, and hence LOADs and SAVEs, will actually be slower.

I would be interested to hear if other DFSs have cured the problem, and more especially if Acorn have changed later DFS issues. Would you want a CP/M system which took nearly half a second per sector?

Finally, one small point in the toolkit routines. Line 2150 should be:

2150 ROR A: AND# 1

The head number is 1 for drives 2 and 3 on double-sided drives. This has no effect on the BBC Micro itself, but the discs might be unreadable on a machine using a different disc controller. – **G.M. Dougan, East Linton, East Lothian.**

Something good from Nuneaton

THANK you for printing Mr Flanaghan's letter on getting inverted commas to PRINT in the June 1984 of The Micro User.

I have for some time been worrying my head over this, as I have written an analysis program for my husband's business and wanted to be able to call up a particular file of ongoing information, from within the program, for whichever consultant the program was being run.

Now, having obtained the consultant's name at the beginning of the program (A$), the insertion of the lines shown right has resolved my dilemma.

I hope you approve of this letter written on a BBC B with Wordwise and an Olympia electronic compact typewriter – a system I have found most satisfactory. – **Ruth Samways, Plymouth.**

P.S. I always knew something good would come out of Nuneaton, whatever Terry Wogan says!

```
   90 IF A$ = "KEITH SAMWAY
S" THEN D$ = """DATAS"""
  100 IF A$ = "FRED BLOGGS"
 THEN D$ = """DATAB"""
  110 IF A$ = "MARY JONES"
THEN D$ = """DATAJ"""
  200 D=OPENUP D$
  210 PRINT#D,W,WW :REM etc
 etc etc
  220 CLOSE#D
```

Down the Tube?

WHILE generally agreeing with Alan Plume's enthusiastic review of the 6502 second processor and the Bitstik I feel he has underplayed the drawbacks and annoyances of the systems.

Potential users must be prepared to find the great majority of popular firmware, such as Wordwise, not working when the second processor is powered up.

Turning the mains on and off is inelegant. Why didn't Acorn create an FX call to enable/disable the processor?

While obviously many software houses will blame Acorn, most of the problems appear to be caused by non-conformance to Acorn's published rules.

No doubt software houses will be able to have a second bite at the cherry by selling second processor compatible

→

MICROMAIL

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upgrades of existing products.

As regards I/O, the Bitstik lacks an input digitiser but more importantly the highest resolution hardcopy output from the system is limited to a Mode 1 screen dump.

Thus the fine detail of drawings cannot be realised in spite of the infinite resolution claimed for the system. The original Apple Bitstik had a plotter driver, so why not the Acorn one?

On the plus side, the new Acorn DFS is a great improvement on the old one and does not hang up while printing/reading/editing long files.

View, although slightly unstable in scrolling at times, is superb in the system.

BCPL recognises the spare memory and a "high" version isn't necessary. To my surprise Watford's 1.3 DFS appears to work in the system, although my tests have not been very extensive.

Bitstik's precision drafting capability is a joy to work with and circuit diagrams are a doddle once a symbol library has been created.

Users just requiring extra memory for word(wise) processing should also seriously consider the alternative packages of Aries-B20 RAM expansion with Wordwise-B20 or the more expensive and versatile Solidisk system. – **M.J. Maytum, Bedford.**

Microweb standard

CAN I enter a plea on behalf of all users of Acorn's Prestel adaptor for Microweb to switch from the communications standard it currently uses to that of Prestel, V23 Mode2.

I have tried to contact Microweb with the Prestel adaptor without any success at all. I note from your recent issues that you have been advocating the multi-mode Nightingale modem.

If you were to make the suggested change, then all users of the standard Acorn equipment would be able to talk to Microweb plus all the other Grapevine users, since they would be able to switch their modems to V23 with no problems.

I received my Prestel adaptor only last week, after having had it on order for many months. Since advance literature was not available I had to take pot luck that the unit would allow access to non-Prestel systems.

It does not (apart from BT Gold), and so may I warn prospective purchasers of this unit that if they want anything besides Prestel, then they will need a multi-mode unit, like the Nightingale.

Another useful piece of information prospective purchasers might like to have is that, contrary to preliminary information in the BBC Micro User Guide to the effect that the Prestel unit would use the 1MHz bus, it does not. It uses the RS423 socket, which will be a pest for anyone using a serial printer.

That said, I have no doubt that the Acorn unit is very good for its main stated purpose, to link to Prestel. I hope to verify this when my user i.d. and password are sent to me.

Meanwhile could Micro User please consider the above suggestion? I suspect many people will buy the Acorn unit, partly for the name, and also because it is cheaper than multimode units, hence with V23 Microweb will not cast the non-Nightingale users into outer darkness, as it does at present. – **R.D. Wright, Guildford, Surrey.**

● Microweb is very much an interactive communications medium – we want people to talk to us as much as we want them to hear what we've got to say.

In order to do this we listen and talk at the same speed – 300 baud. We can't go faster for technical reasons.

However Prestel doesn't expect much user response and can share out the speeds differently, using 1200 baud when it talks, and only 75 when it listens.

Both systems have their advantages. While at the moment Microweb is staying at 300 baud, we are strongly considering adding facilities for Prestel type modems. In fact, all we want to be sure of is the demand, so if you want a 1200/75 baud Microweb, write in and tell us.

We would still recommend a modem with multiple baud rates. Considering their extra power, they cost very little more.

Eprom copying

IN a recent advertisement Solidisk claim to have sold 10,000 units. Even assuming this to be a slight exaggeration, there are quite a few Solidiks around and now with the 256k upgrade on offer this will no doubt encourage further sales.

The system lends itself to eprom copying. We all know there is no such thing as complete software protection. However there is a trade off to be made – the effort expended to break the protection, or find someone with the eprom you need, the gratuity paid to let you copy it, photocopying the manual. All this against the cost of the legal purchase.

While a few folk will delight in the challenge of breaking the protection, most just want the software and are willing to pay. But who wants to purchase an eprom to offload it at once?

Software suppliers do nothing to cater for this market, they just complain about piracy.

Why not offer Solidisk owners the eprom programs on tape? The cost should reflect the saving of eproms and create another outlet.

The majority of micro users do not begrudge the programmer his pound of flesh, but they don't want to part with the whole sheep. Will any software house give a lead? – **R.D. Esson, Wembley, Middlesex.**

● Interesting point. So far we've only heard of one company offering their products at a lower price for Solidisk users. Perhaps it will catch on.

Need for a DFS ROM

IF a disc interface is fitted, is there any need for a DFS ROM? If so, what does the ROM do?

This leads to a second point. Where exactly, is the ROM

No Olympic joysticks

I RECENTLY bought Micro Olympics. I find it an exceptionally good program, with good, smooth graphics, and good sound effects.

The computer also puts up a good challenge and so far I can only beat it at hammer, discus and occasionally high jump and 100m.

However, I found one slight point which I think could improve the game and perhaps save wear on the keys, and that would be an option to use joysticks.

I would be very grateful if it would be possible to produce a joystick version which I would be able to exchange for my present one. – **Tom Lewis, St Erth, Cornwall.**

● Whereas all keyboards are standard, all joysticks are not – we only wish they were. It would be impossible to write a program to cater for all the variations and sensitivity in all available joysticks.

Apart from this fact, backward and forward movement of the joystick lever at the rate needed would cripple it, and the buttons on a double fire button stick are not sensitive enough.

Sorry, your fingers are just going to have to get stronger and stronger.

● *Want to write to Micromail? The address is: Micromail, The Micro User, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.*

socket? I am puzzled by this as the User Guide says the ROM socket is on the left hand side of the keyboard.

In The Micro User I have read articles and adverts about internal ROMs. This contradicts what is said in the User Guide. I thought ROMs are large cartridges that plug into the socket mentioned in the User Guide. – **Kevin Lomax, Bolton, Lancs.**

● Second point first. There are lots of ROMs on the BBC Micro.

The ROM socket mentioned on the left hand side of the keyboard is supposed to go in place of the perforated plastic rectangle there.

The socket is meant by Acorn to take ROMs containing additional vocabulary for your speech synthesis chip, or alternatively cartridge type programs on ROM. Other firms are now using the "ashtray" to fit a ROM extension socket, allowing you to change ROMs without removing the micro's lid.

Then there are the amazing sideways ROMs hidden away under the keyboard. You have to dismantle the micro to get at these. They are Acorn's master touch, giving the BBC Micro incredible power by allowing you instantly to turn the micro into a word processor, communications terminal, machine code development system and so on and so on. Not only that, the chips can share jobs out with each other!

Now one of these ROMs is the DFS chip, which like the other chips, is a clever kind of program. This allows the BBC Micro to make use of discs. However it needs quite a few other chips and sockets to do this. The whole ensemble is called the disc interface.

Better pilot now

I ENJOYED the game Space Pilot in the June 1983 Micro User, but was disappointed to discover that the program Joykeys (October 1983) did not work as negative Inkeys are used to detect key closure, so I did it myself.

Change line numbers 120, 160, 170, 180, 190, 890 and 900 to the following:

```
  120PROCT:IF(ADVAL(0) AND
3) =1 AND L%>8 PROCG
  160DEFPROCM(RQ%):IF ADVAL
(2)DIV256<80 Y%=Y%-RQ%*(20/
W%)
  170IF ADVAL(2) DIV256>180
 Y%=Y%+RQ%*(20/W%)
  180IF ADVAL(1) DIV256<80X
%=X%+RQ%*(30/W%)
  190IF ADVAL(1) DIV256>180
X%=X%-RQ%*(30/W%)
  890IF ADVAL(1) DIV256<80D
R%=DR%+2 ELSEIF ADVAL(1) DI
V256>160 DR%=DR%-2
  900IF (ADVAL(0)AND3)=1 DR
1%=DR1%+2:MOVEX%,Y%:VDU226:
PROCFO:GCOL4,0:SOUND0,-5,4,
1:MOVEX%,Y%:VDU226:IF F<8 E
NDPROC
```

It's a good game now! – **Richard Deakin, 51 Kalmia Way, Forrestfield, Western Australia.**

Bye-ter bitten

I DON'T know whether Mr Bye (Micromail, May 1984) will be relieved or disappointed to find that I am not a schoolmaster and have no wish to give him "six of the best" for his views. (I would reserve punishment for the editors, and contributors, who publish programs which cannot possibly work!)

If we are to follow the school analogy though, I would give him a B– for not thinking things through properly.

He is absolutely right in thinking that merely replacing GOSUB with PROC will not produce a properly structured program. The program on Page 63 of the May issue, which has obviously been converted from another version of Basic with only the changing of GOSUBs, provides an excellent counter-example.

You can still see the gap in the main program to allow the GOSUBs to have the early line numbers.

The real problem is that the division into modules, whether procedures or functions, comes at the design stage, not when we are writing the actual Basic statements.

If the design has been done properly the procedures will fall out naturally, without any need to put them in specially.

It is, in fact, a much more natural way of thinking about a problem. If we are telling someone else we say "If this is true then do that" not GOTO.

Perhaps one of the biggest problems for hobby programmers is that most of us do not design programs at all; we get our pleasure from writing the Basic code.

This lack of design often leads to over-complicated programs which are difficult to amend or debug. If programs are properly structured amendments are relatively easy, and confined to well-defined parts of the program.

Printing mailing labels is, for instance, a self-contained task and, if the job is contained in PROCprintlabels, it is not difficult to change the program if the size of label changes.

If we mix the printing in with the selection of labels to be printed we will probably need more changes and the whole of the program will need retesting.

If we use functions and procedures with the minimum of contact with the rest of the program, by using parameters and local variables, we can gain a further advantage.

We can, in effect, extend Basic by storing standard tested code for use in many programs with no change except for renumbering.

I now have a collection of standard modules for such things as validated input, reading the real time clock and drawing circles.

When I bought the graphics ROM I was able to amend my circle procedure and know that the program remained correct.

I cannot think of any time when a GOSUB gives an advantage over a procedure, and repeated use of procedures is quicker than GOSUBs, for which Basic has to search every time they are used.

GOTO and GOSUB are provided in the language but their proper use is, surely, to allow us to convert programs not designed by ourselves from other computers. – **David H. Wild, Hemel Hempstead.**

Sydney user group

WE would be grateful if you would inform your readers that a new user group is to be set up in Sydney, Australia, and advise any interested persons to make contact at the Sydney BBC Microcomputer User Group, c/o Mr Stuart McCann, 500 Miller Street, Cammeray, N.S.W. 2062, Australia. Tel: Sydney 923 1137. – **R. Stuart-Harris, Killara, NSW.**

Speedier micro

I HAVE discovered a method of speeding up the already fast Beeb. Type:

?&FE45=255

and:

?&FE46=255

This accesses the timers for the system VIA causing the computer to virtually ignore the keyboard and concentrate on executing the program.

This increases the time for a FORI%=1 TO 10000 loop from 7.5 seconds to 0.3 seconds.

This is ideal for a program where a large amount of processing is involved but if any input is required it will need to be reset to a more normal value.

Type:

?&FE45=14
?&FE46=12

These values may vary

→

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slightly depending on what the computer is doing.

By inputting low values the computer will concentrate on the keyboard and output will be very slow. This enables you to see how the computer forms its characters.

Other strange effects may be seen. Play a Mode 2 game and in the middle of your game press Break. Type:

?&FE45=1
?&FE46=0
MODE 2

The screen that you were just playing will reappear and slowly clear. – **I.A. Padgett, Tewksbury, Glos.**

Last of the primes

FURTHER to my recent letter on the subject of generating prime numbers, I have now solved the problem of printing decimal numbers from the machine code program and enclose a copy of my finalised program (left).

Primes from 1 to 500 are produced in 0.57 seconds while the longest time taken over any sequence of 500 numbers (up to 17,000) is about 1.35 seconds.

The first and last numbers input may be odd or even. – **B. Daulton, Lincoln.**

```
   10 REM Prime number gene
rator
   20 REM (c) B.Daulton
   30 MODE7
   40 VDU23;8202;0;0;0;
   50 PRINTTAB(10,5);CHR$14
1;CHR$130;"PRIME NUMBERS"
   60 PRINTTAB(10,6);CHR$14
1;CHR$130;"PRIME NUMBERS"
   70 PRINTTAB(3,10);CHR$13
1;"This program generates p
rime"
   80 PRINTTAB(3,12);CHR$13
1;"numbers in the range 1 t
o 17160"
   90 PRINTTAB(4,20)"Press
the space bar to continue"
  100 Z$=GET$:IF Z$<>" " TH
EN 170
  110CLS:PRINTTAB(5,5);CHR$
134;"You will be asked to s
pecify the"
  120 PRINTTAB(3,7);CHR$134
"first and last numbers."
  130 PRINTTAB(4,9);CHR$130
"To show all primes in the
specified"
  140 PRINTTAB(3,11);CHR$13
0"range you should not spec
ify a range"
  150 PRINTTAB(3,13);CHR$13
0"of more than 700"
  160 PRINTTAB(5,20);"Press
 the space bar to continue"
  170 Z$=GET$:IF Z$<>" " TH
EN 170
  180 DVID=&70:DVIS=&72:DVI
DCH=&73:DVISCH=&75
  190 NUM=&76:FIRST=&77:LAS
T=&79:Count=&7B:OSWRCH=&FFE
E
  200 FOR PASS = 0 TO 2 STE
P 2:P%=&900
  210 [OPT PASS
  220 .BEGIN
  230 LDY DVISCH
  240 LDA FIRST:CMP #1:BNE
Continue
  250 LDA #3:STA DVIDCH:LDA
 #2:STA FIRST:JMP Next
  260 .Continue
  270 CMP #2:BEQ Next
  280 CMP #3:BNE PDIV
  290 .Next
  300 LDX #7:LDA #9
  310 .Space
  320 JSR OSWRCH:DEX:BNE Sp
ace
  330 LDA FIRST:ADC #48:JSR
 OSWRCH
  340 CMP #50:BNE PDIV
  350 INC FIRST:JMP Next
  360 .PDIV
  370 LDA NUM:STA DVIS:LDA
DVIDCH:STA DVID:LDA DVIDCH+
1:STA DVID+1
  380 LDX #16:LDA #0
  390 .LOOP
  400 ASL DVID:ROL DVID+1:R
OL A
  410 CMP DVIS:BCC OVER
  420 SBC DVIS
  430 .OVER
  440 DEX:BNE LOOP
  450 CMP #0:BEQ NEXNUM
  460 INC NUM:INC NUM
  470 LDA DVISCH:CMP NUM:BM
I PRIME
  480 JMP PDIV
  490 .NEXNUM
  500 INC DVIDCH:INC DVIDCH
  510 LDA #1:CMP DVIDCH:BNE
 GOON
  520 INC DVIDCH+1
  530 .GOON
  540 LDA DVIDCH:SEC:SBC LA
ST:LDA DVIDCH+1:SBC LAST+1:
BPL FINISH
  550 DEY:BNE AFTER
  560 INC DVISCH:LDY DVISCH
  570 .AFTER
  580 LDA #3:STA NUM:JMP PD
IV
  590 .PRIME
  600 LDA DVIDCH:STA DVID:L
DA DVIDCH+1:STA DVID+1
  610 .CONVERT
  620 LDX #16:LDA #0
  630 .LOOP1
  640 ASL DVID:ROL DVID+1:R
OL A
  650 CMP #10:BCC LESS1
  660 SBC #10:INC DVID
  670 .LESS1
  680 DEX:BNE LOOP1
  690 CLC:ADC #48
  700 PHA:INC Count
  710 LDA DVID:ORA DVID+1:B
NE CONVERT
  720 LDA #9:SBC Count:TAX
  730 .SPACE
  740 LDA #9:JSR OSWRCH
  750 DEX:BNE SPACE
  760 .DISPLAY
  770 PLA:JSR OSWRCH
  780 DEC Count:BNE DISPLAY
  790 JMP NEXNUM
  800 .FINISH
  810 LDA #10:JSR OSWRCH:JS
R OSWRCH:JSR OSWRCH:JSR OSW
RCH
  820 RTS
  830 ]
  840 NEXT PASS
  850 MODE1
  860 VDU23;8202;0;0;0;
  870 COLOUR2:INPUT TAB(1,1
0)"Range required.(First,La
st)",a,B
  880 IF a<1 OR a>17160 OR
B<a OR B>17160 THEN 850
  890 IF a DIV 2= a/2 THEN
A= a+1 ELSE A=a
  900 CLS: TIME=0
  910 PRINT TAB(5,2)"PRIME
numbers between ";a;" & ";B
  920 PRINT
  930 !DVIDCH=A: ?DVISCH=IN
T(SQR(A))+1:?NUM=3:!FIRST=a
: !LAST= B
  940 CALL BEGIN
  950 PRINTTAB(8,28);"Time
taken = ";TIME/100;" secs"
  960PRINTTAB(6,30);"PRESS
SPACE BAR TO CONTINUE"
  970 Z$=GET$
  980 IF Z$= " " GOTO850 EL
SE 980
```

● This correspondence is now at an end – please! **Editor.**

Problem cracked

REGARDING G. Black's letter in the June Micromail concerning keyboard costs . . .

I too suffered an intermittent keyboard fault. It was not the cost of repairs that daunted me, but the time it took – six weeks.

So armed with a soldering iron, an ohm meter and a magnifying glass I set forth. It soon became apparent that several *hairline cracks were present on the printed circuit board under the keys.*

These were easily bridged, and no similar further problems have occurred. – **A. Moulder, Rainham, Essex.**

Good value

MR TAYLOR (Micromail June 1984, page 182) complains of the high cost of disc based software. He quotes a price of £1 for bulk purchases of discs.

While I am sure that discs can be bought for such a sum, all the discs used by Dataware cost in the order of £3 each and are covered by a manufacturer's 5 year guarantee – this contrasts with perhaps 40 pence for a tape.

Additionally our disc software utilises the superior facilities of the disc filing system and contains more data than the tape. We have never had a faulty disc returned – sufficient reason for not using cheap discs.

I trust that this puts things into perspective. – **Les Peters, Dataware, Swindon.**

Dicey . .

I AM trying to program a game called cricket where instead of a ball only two dice are used.

On one die the data is "1", "2", "3", "4", "5", "6", "OWZAT" which is for the batsman. For the bowler the data is "Stumped", "Not out", "Bowled", "No ball", "Caught", "Lbw".

I know how to print random numbers but can you tell me how to print random words? – **K. Howell, Northampton.**

● We're not sure how you get seven things on one die. Casting our minds back, we reckon that '5' was missing on the first die.

Notwithstanding, if you know how to generate the random numbers required, simply use these numbers to index a subscripted variable. It sounds fancy, but Mike Bibby's beginners articles in the July and August 1984 issues make the ideas crystal clear.

In short, considering just the second die, make **die$(1)="stumped"** **die$(2)="Not out"** and so on. Then choose the one you mean to be die$(RND(6)).

This will give you random words.

Memory fault

FIRST of all, add my name to your very long list (reached 'No room' yet?) of people who enjoy your magazine from the first to the last page.

When using the AUTO line numbering sometimes a white dot appears on the screen. When the line number 'lines' up with this dot (about 1-2 pixels) the numbering starts at 10 again. Any suggestions? (OS 1.20/ DFS 0.90/BBC 100 drive).

*In one of your articles it was claimed that *TV0,1 hardly made a difference. This is true for normal TVs, but it makes quite a difference on TVs converted into monitors.*

The User Guide states that

→

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MICROMAIL

From Page 181

END is optional, so why do I get 'No Proc' in:

```
   10 N=0 : ENVELOPE 1,1,0,
0,0,0,0,0,10,-1,0,-1,126,1
   20 REPEAT: N=N+2 : PROCS
OUND(N) : UNTIL N>80
   30 REM ......END
   40 DEFPROCSOUND(N)
   50 SOUND 0,1,6,5 : T%= I
NKEY(60-N)
   60 ENDPROC
```

– **K. Pigge, The Hague.**

● Your problem with AUTO points to a definite memory fault somewhere – or perhaps a ULA problem. Before taking it to a dealer though, why not take the lid off and press the chips down firmly. Often the only problem is the chips not seating properly.

END is optional only when you don't have to have it!

If you have procedures after the logical finish of the program and there's no END to stop it, the micro will just plough through into the first procedure (starting at line 40).

The important point to note is that it hasn't got there via a legitimate PROC call. When it encounters the ENDPROC at line 60, it hasn't come from a PROC and so gives its plaintive 'No Proc' message.

Merging

*MANY people have been confused over the issue of merging programs, over *SPOOL and the like.*

There is a much more convenient method. If you want to merge the program in memory with one currently on tape, enter:

PRINT ~ (TOP-2)

We'll call the answer NNNN. Then:

***LOAD"PROG" NNNN**

to load the second program, PROG.

When the program/s have loaded, you should find that although you can see both programs, each will use their normal line numbers.

To remedy this, type RENUMBER – and the programs should have merged.

– **Richard Browning, Bishops Lydeard.**

● Your method is, in fact, shown on page 402 of the User Guide, but let's face it, that's a long way to plough through for it!

On disc we reckon the *SPOOL method to be far the best, but for tape the method you describe is easier.

And finally, with tongue firmly in cheek . . .

Looking for MacRo User!

Dear Deidre,

Sorry I haven't been in contact yet, but Bob's been driving me mad. I thought that bringing him away on holiday to Scotland would cure him of the obsession with his thing but, alas, no such luck.

It started before we'd even left. I'd forbidden him to bring his micro or any computer books – and especially THAT magazine, the one with that unpleasant Barry Tree. It was only when I accidentally overheard a phone call Bob was making that I realised what was wrong. I was so shocked that I dropped the glass.

He was calling that awful Mike Cook (you know, the one with the artistic way with diagrams) and trying to find out a way of interfacing his Beeb with the car's cigarette lighter. I soon put a stop to that.

The drive up wasn't all that easy. Bob just sat there in the passenger seat watching the odometer with glazed eyes. Every now and then he muttered "so that's how binary works" and gave a deep sigh.

As soon as we reached Fort William he was out of the car and into every newsagent's hunting for the latest issue of Micro User.

I've never been so embarrassed in my life. Apparently his nephew Nigel had told him that there was a special Scottish edition of Micro User called MacRo User so he was asking for that.

Eventually I got him to the chalet. It was beautiful, miles from anywhere (including, sadly, the loo). Now I know what they mean by communing with nature.

Anyway, the first few days were marvellous. He went all over the place. Skye, Aviemore, Sauckiehall Street, we saw Scotland in all its scenic beauty. Only one thing worried me, Bob wasn't whining as much as I would have expected. And he was spending longer and longer in the bathroom.

You wouldn't believe what he was doing there. He was playing with the biggest pocket calculator I've ever seen in my life. Apparently it was a Blunt's pocket computer with all the Basic functions necessary to satisfy Bob's obsession. Clive had apparently lent it him saying: "We're all men of the world, use this if it's absolutely necessary".

Of course I confiscated it immediately and soon Bob was back to his usual whining self.

I thought that maybe searching for the Loch Ness monster might keep him occupied but I should have known better. After an hour he started grinning to himself and I knew something was wrong. "I've got a great idea for a computer game", he blurted out before he could stop himself, "I'm going to call it Nessy Hunt".

With that I bundled him into the car and took him up Ben Nevis. I've found that if I tire him out it gets rid of his funny ideas.

It was at the tourist information centre in Fort William that, through the throngs of tartan-trousered American tourists, I saw the notice advertising a guided nature walk in Glen Nevis. Just the thing to keep Bob occupied, I thought, so there we were at 10 o'clock in the car park at the bottom of Ben Nevis waiting for the ranger.

I'd expected a Scotsman called Angus or Jock in a kilt or something, but the ranger who turned up was wearing jodphurs, had a Birmingham accent and was called Walter.

Well the journey up the valley was fascinating. Walter really knew a few things about wild flowers. Fragrant orchids, butterworts, mountain saxifrage – he showed us them all.

Of course it was too good to last. As we were coming back down we passed through a quiet, lifeless wood.

"Like Mirkwood", Walter murmured. "Oh are you a Tolkien fan?" I asked. "Not really", he answered, "I just play the Hobbit on my Beeb".

Well it was like a starry saxifrage to a deprived botanist. Bob was in like a shot.

"Have you had trouble with Thorin? Alice did".

And that was the end of the nature walk. The rest of the trail was ignored as Bob and Walter rambled on and on about the Beeb, adventures and micros in general.

And that's how the holiday has turned out. Bob now spends all his evenings in the Tartan Haggis with Walter, knocking back heavy and discussing a map-reading program and a bagpipe tutor for the Beeb.

So once more I'm a micro widow left wondering what's so funny about a "loched file".

Next year it's Blackpool. See you soon,

Andrea

P.S. You'll never believe it, but Bob and Walter have actually sold a program. It's a follow-up to Micro Olympics, called the MacRo User Highland Games.

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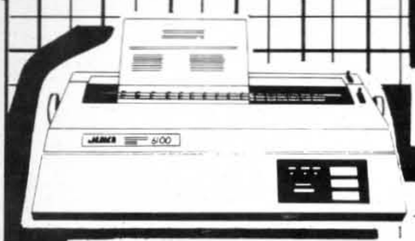

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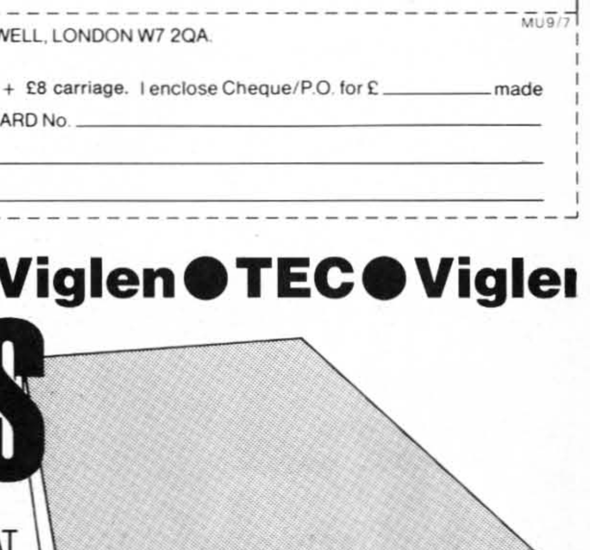

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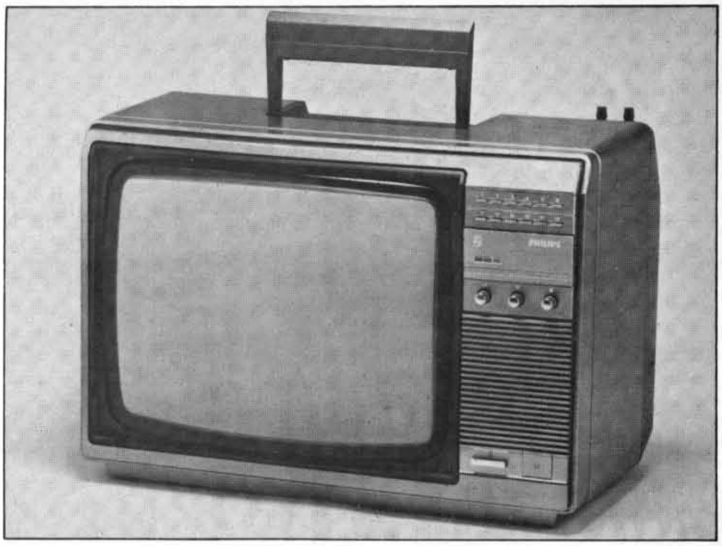

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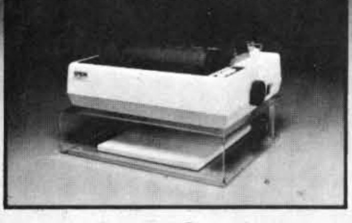

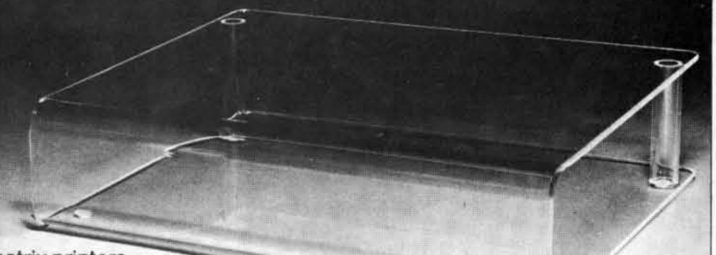

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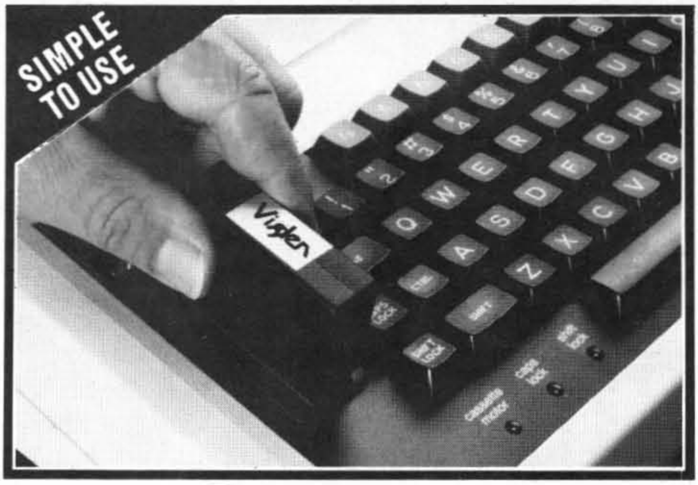

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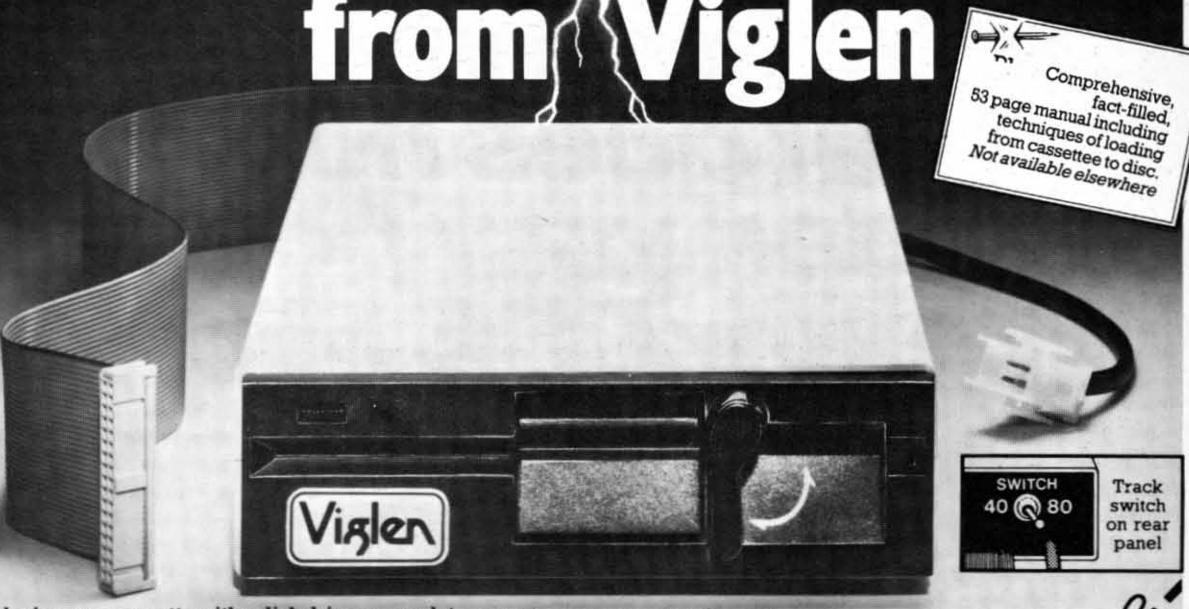
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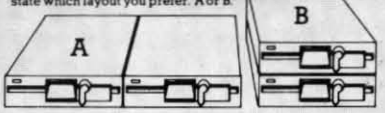

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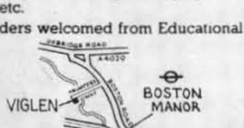
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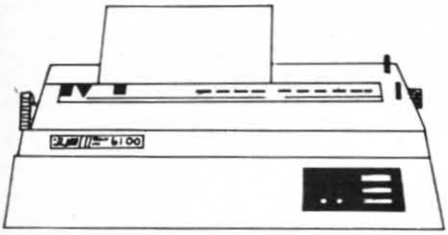

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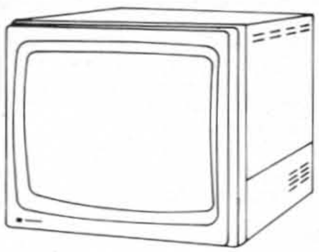

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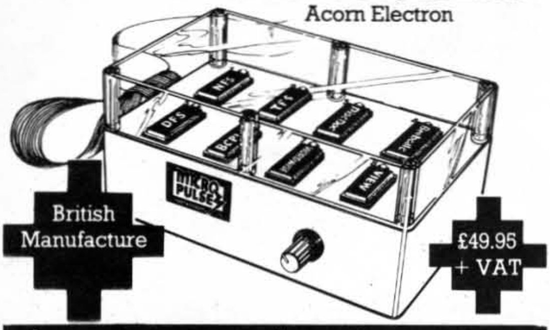

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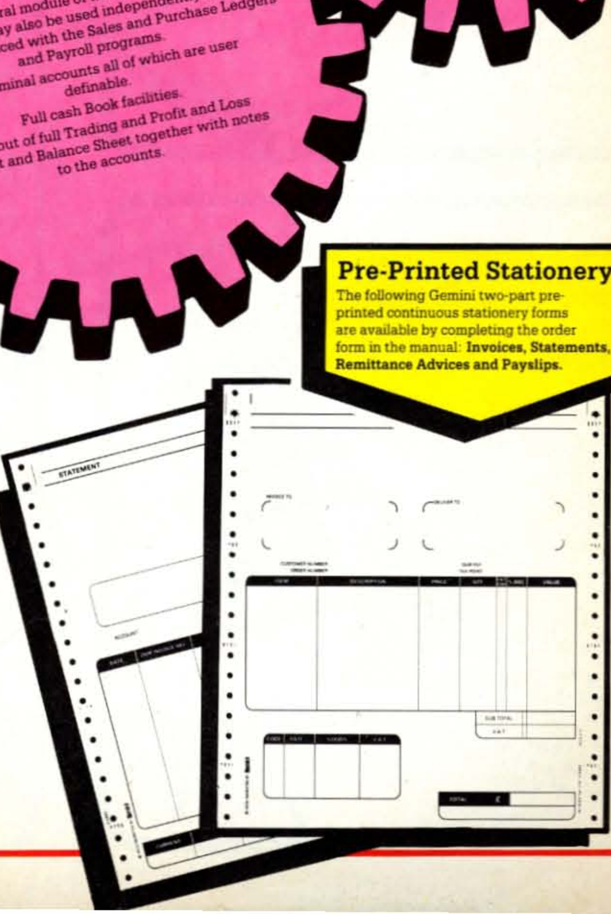

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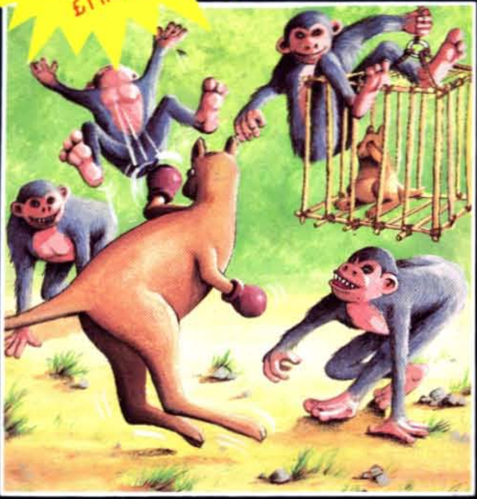

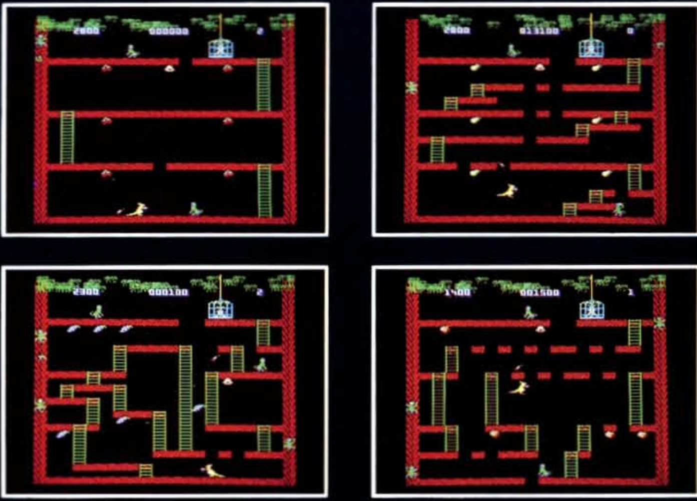

WALLABY (32K) £7.95

From the author of Overdrive comes another superb arcade-action game. You must guide Wally the Boxing Wallaby up the ladders to rescue the baby wallaby from its cage. The evil monkeys will try to stop Wally in his tracks; he can kill the monkeys by a swift upper-cut, but watch out for the apple-cores which they hurl at him without compassion. Five screens of increasing difficulty with bonus fruit on each level. Yet another winner from Superior Software!

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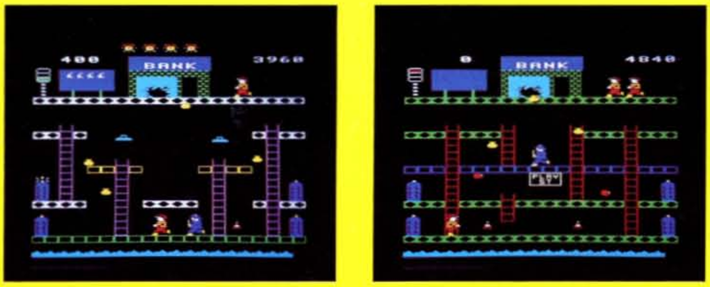
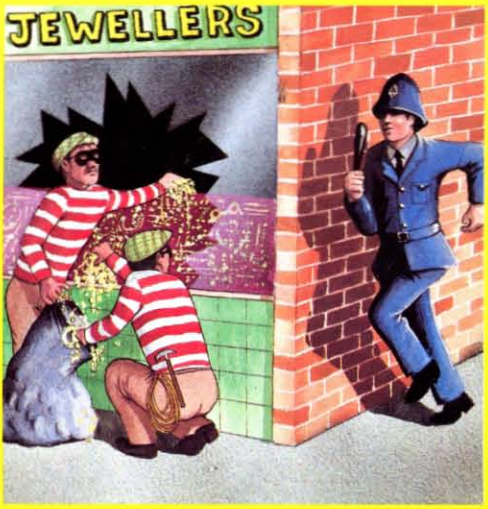
Many of our titles are available in Boots, W.H. Smiths, John Menzies, Rumbelows, Laskys, Currys, HMV, Greens at Debenhams and Spectrum Shops. Also at all major computer dealers – Eltec Computers, Micro Management, West Coast Personal Computers, Microstyle, Electronequip, 3D Computers, Computerama, GTM Computers, etc. Our software is also available through all the major distributors, and directly from us by mail-order.





SMASH AND GRAB (32K) £7.95

An excellent and original arcade-style game in which you take the role of a robber aiming to snatch bags of gold from the bank. A policeman is after you … he is able to jump at you or squat down and try to hit you with his truncheon. You must also keep clear of the flying police cones and floating dustbin lids. There are 3 fascinating screens of action including play streets with bouncing balls, one-way streets, conveyor belts, traffic lights and police-boxes. A novel and amusing game.

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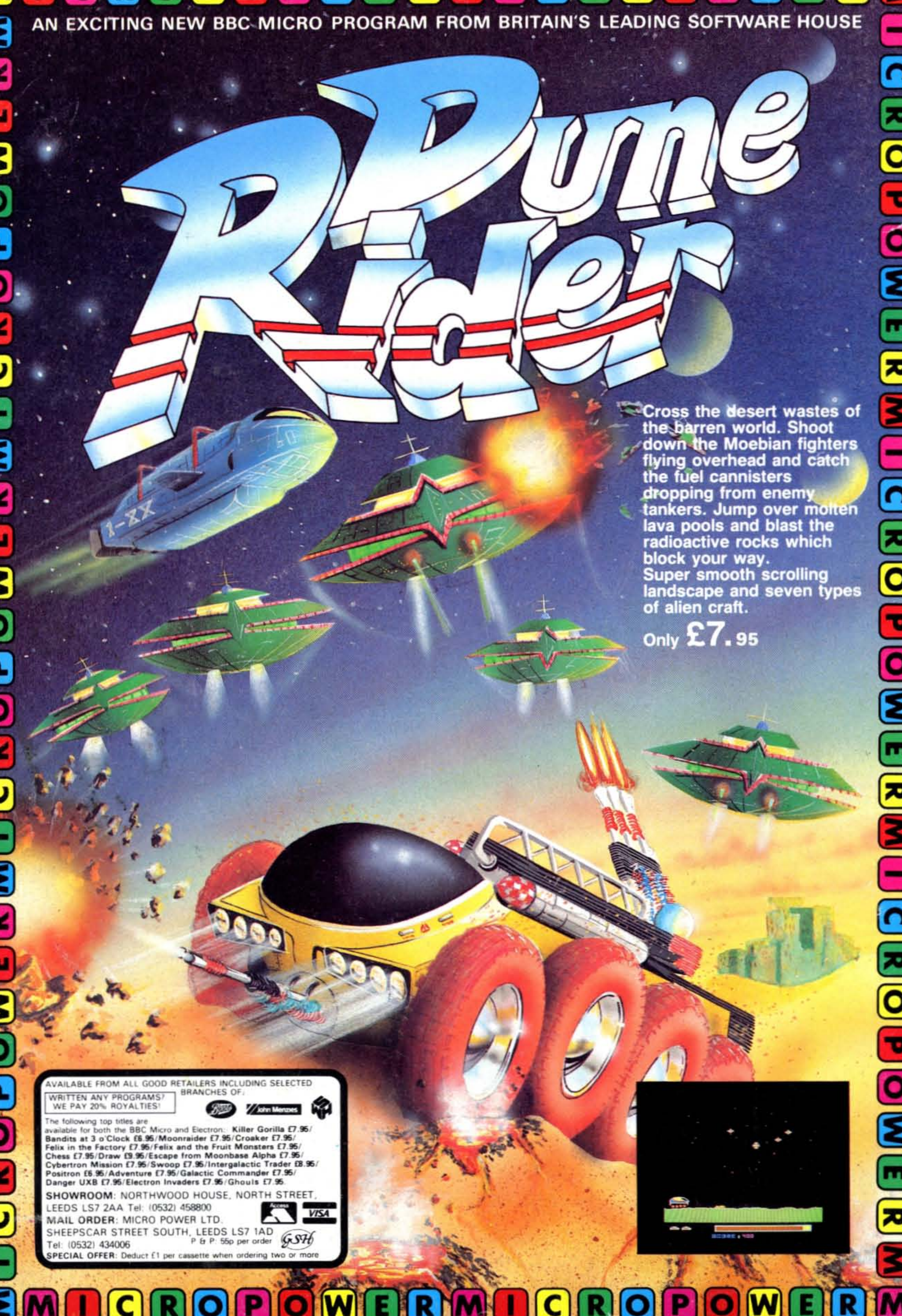

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